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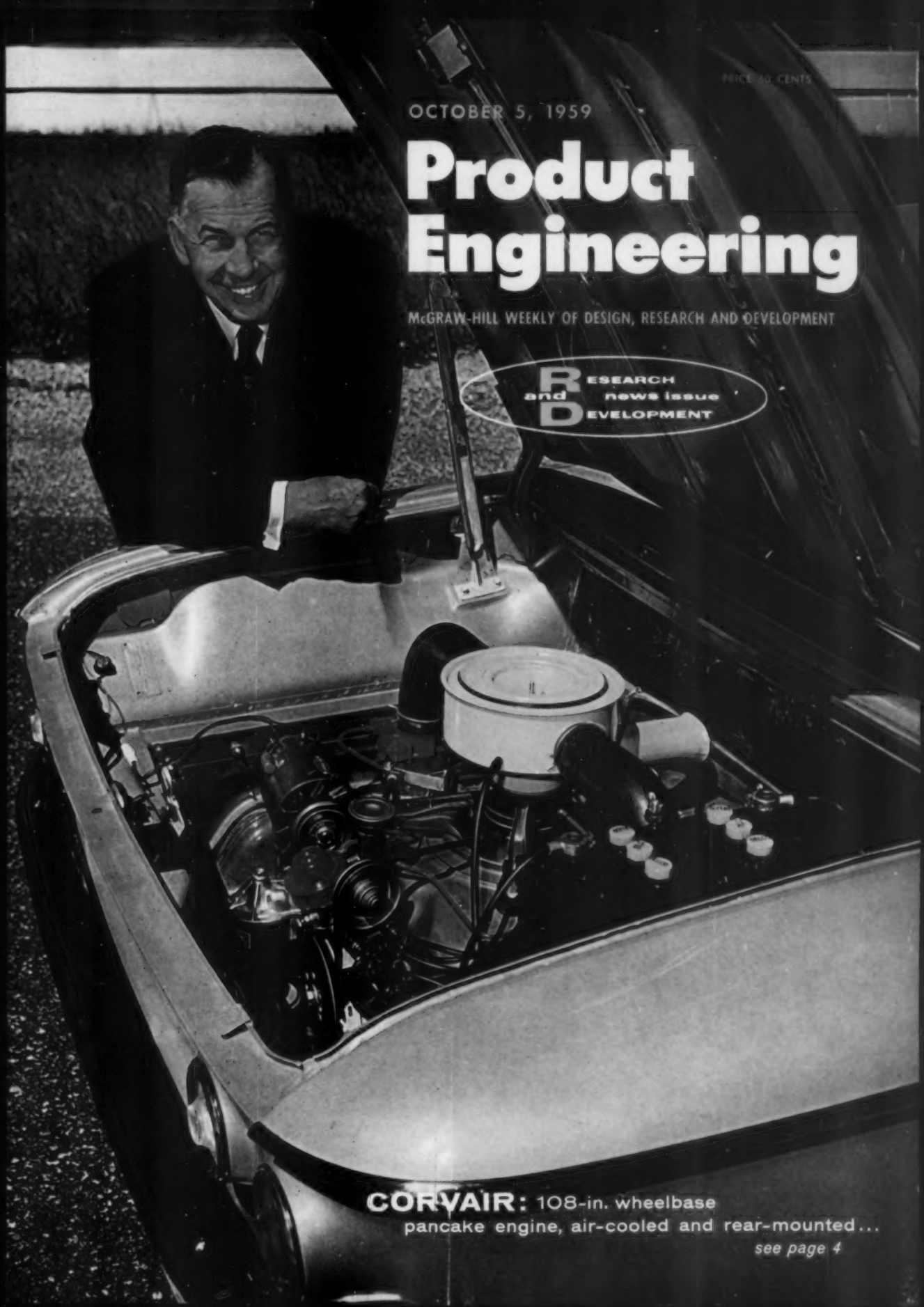
OCTOBER 5, 1959

Product Engineering

McGRAW-HILL WEEKLY OF DESIGN, RESEARCH AND DEVELOPMENT

R and D RESEARCH AND DEVELOPMENT news issue



CORVAIR: 108-in. wheelbase pancake engine, air-cooled and rear-mounted...

see page 4

Nature's Tiny Flashlight. There's more to the surprisingly bright flashes of the firefly (*Lampridae*) than the body chemicals which it burns. In addition, a clear, curved section of the insect's skin acts as a magnifying lens and a layer of crystals as a reflector.

Miniature Angle Counter. Moving tape on this counter used in aircraft (approx. 3½″ long) shows horizontal angular deviation from pre-set point. MPB bearings on key shafts help keep torque at approximately 0.1 ounce-inch at temperatures from −55°C to +125°C!

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the DESIGN issue for October 12

FEATURING

- **The planetary friction drive**
  Step-by-step design procedure to replace gears with preloaded friction rollers.

- **Clay models will shape your ideas**
  For a quick preview of design—and of production problems.

- **To choose a battery-powered motor**
  Product designer and motor manufacturer cooperate to pick the best dc motor for a job.

- **When specifying cast iron**
  A review of basic microstructures and how they affect design properties.

- **5 linkages for straight-line motion**
  Convert rotary to straight-line motion without the need for guides.

- **Magnesium-lithium**
  Offers 25% weight saving over conventional Mg alloys.

- **12 special electroplates**
  Here are their uses, properties and costs.

- **Polyester premix molded parts**
  Can replace metal parts in many applications—but they need design attention.

Product Engineering

McGRAW-HILL WEEKLY OF DESIGN, RESEARCH AND DEVELOPMENT

R and D RESEARCH and DEVELOPMENT news issue

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Product Engineering ..... SIDELIGHTS

R and D RESEARCH and DEVELOPMENT news issue

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● **Tucked neatly into the trunk,** Corvair's 6-cyl, air-cooled engine is one of the most revolutionary designs to come from Detroit (p 23). Its father—or chief obstetrician—is Edward N. Cole, also on our cover, general manager of Chevrolet. Cole was chief engineer of Chevrolet for four years before becoming general manager (and vice-president)—he's the first in the history of General Motors to make that step. This engine-in-the-rear design is another first—evidently no coincidence.

● **If you're like us, the Soviet moon rocket** caused a sinking feeling in your stomach, a wistful look at the moon, and a shrug. Presumably the shrug has held you up through all of Mr Khrushchev's delicate references, but the following anecdote may offer needed help. Admiral Corporation wrote a letter to the Soviet Exhibition of Science, Technology & Culture awhile back asking that the television set bearing Admiral's trademark be removed from display. Russians take their copying very seriously, it seems—right down to the trade mark. Our personal contacts with their engineers (p 37), show that when it comes to engineering they're very serious indeed.

● **The high cost of technology** was never more clearly demonstrated than in the recent purchase, by Northwest Airlines, of 10 Lockheed Electra prop-jets. In 25 years the price has risen 67 times (from $36,500 to $2,400,000 each). For this 67-fold increase, Northwest can carry about 8 times the number of passengers (from 10 to 77) at a little more than twice the speed (190 mph to 400). Incidentally, fares are almost unchanged, around 5¢ per mile, for long hauls.

ABP October 5, 1959

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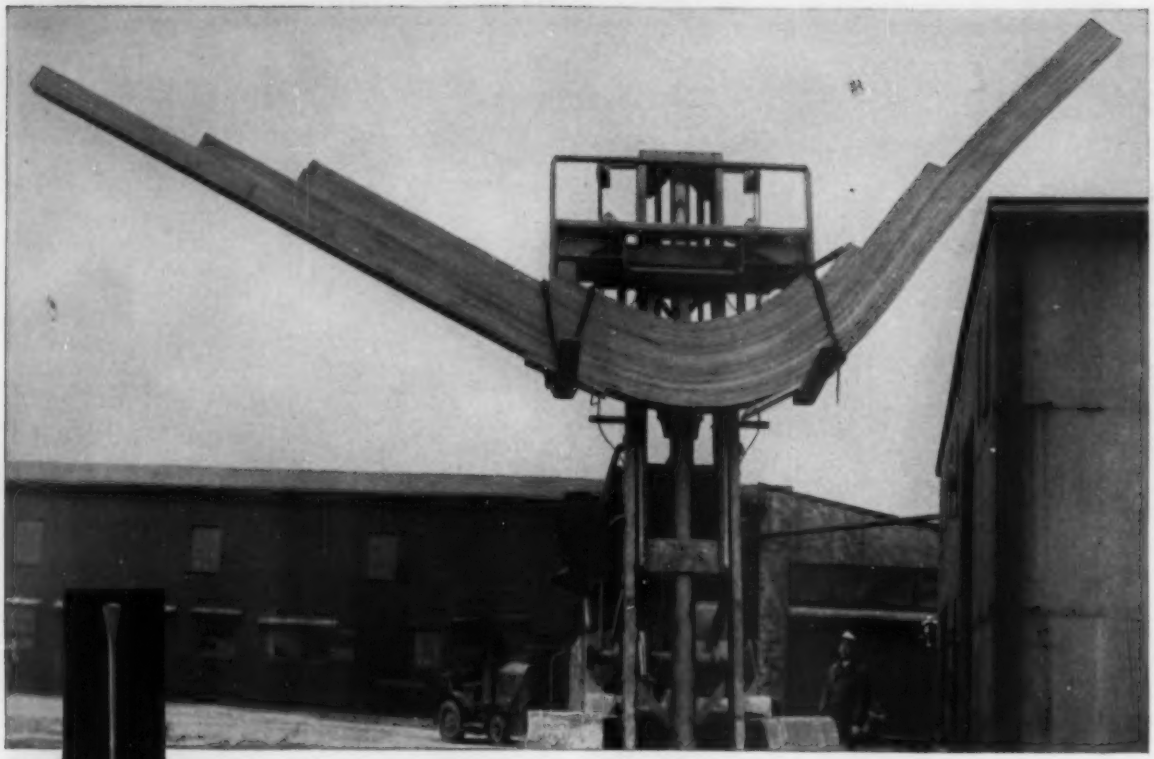

from paddles...to gunboat stems...

GAMBLE solves problems with WOOD!

The armed forces' solid wood life raft paddles often shattered when dropped from a plane, or splintered when used to "pry" a landing craft onto a beach. Then Gamble Brothers developed a paddle with a shatterproof laminated blade and a dense hardwood handle. Result: a stronger, lighter paddle made with less waste of wood.

The gunboat stem problem was different. Wood, as a non-magnetic material, was specified. But who could engineer and fabricate curved sections of such great cross-sectional depth and width? The answer again: Gamble Brothers, by built-up laminations.

Design problems like these are "all in a day's work" to the wood engineers at Gamble Brothers—a unique organization designing and building a wider variety of wood products than any other U. S. woodworking company. Today they're working in three principal areas: (1) improvement of present wood products (2) development of new wood products (3) product development in combinations of wood and other materials.

Why not present *your* design or component problem to Gamble Brothers? WOOD may be the answer!

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DEVELOPMENTS TO WATCH... American

An instrument that measures temperature, pressure, and strain . . .

. . . yet requires no conventional power source, is to be developed by Aerojet-General Corp under AEC contract. This will be a transducer-receiver system for which a radioactive isotope will be the power source. It will activate the unit and make it independent of outside electrical sources—either batteries or power lines.

Thus far, only preliminary investigations have been made; but AEC thinks enough of the project to have awarded more than $63,000 for further work.

New line of miniature rotary air pumps . . .

. . . for use on air samplers, instruments, and the like, is being readied for commercial introduction by Gast Mfg Corp, Benton Harbor, Mich. These will be oil-less pumps (carbon vane), of ½- and 1-cfm capacity. Both vacuum (to 25 in. Hg) and pressure (to 20 psi) types will be offered, for direct or V-belt drive. They operate at 3400 rpm, are less than 2 x 2 in. in size, and weigh less than 3 lb. Technical literature is still being prepared, but Gast expects to be ready for orders before end of the year.

Bromofluorine compounds show promise as lubricants . . .

. . . in oxygen compressors, instruments, and advanced aircraft power plants. Recent industrial and government reports indicate that like chlorinated fluorine compounds (polychlorotrifluoroethylene, for instance), they are noncorrosive, resistant to chemical attack, and have good dielectric properties.

For use as damping oils, R. L. Ehrenfeld told the last ACS meeting, bromotrifluoroethylene, offers higher density (2.4 as opposed to 1.8) and improved performance in the 1000 cps-160 F range. It may also be combined with the chlorine compound to provide a series of oils of varying viscosity and density.

For service at elevated temperatures (600 to 1200 F), brominated gases look extremely interesting, D. H. Buckley and R. L. Johnson of NASA report. With such combinations as Stellite 98 M2 and bromotrifluoromethane (with 1% sulphur hexafluoride), friction coefficients as low as 0.05 can be obtained, without excessive wear.

Transparency of plastics can be increased . . .

. . . by radiation treatments, Westinghouse says, and the process looks promising enough, as applied to polyethylene, to warrant a research program aimed at establishing optimum irradiation conditions.

Westinghouse also plans to explore correlations between optical transmission, density, and radiation-induced crystallinity, and test the effect of temperature on the efficiency of the transformation. By control of radiation dosage and temperature, the company believes, it may be possible to produce polyethylene materials with the exact degree of transparency required.

Improved way to purify the lower boiling metals . . .

. . . and chemical compounds normally separated by fractional distillation is suggested by Bureau of Mines metallurgists.

The specific problem: separating magnesium and cadmium from an Mg-Cd-Al-Zn alloy used for incendiary-bomb casings.

Selective condensation—rather than selective evaporation—they find, is the most effective route. They tried 3 systems: simple distillation; fractional distillation with a series of baffles to collect the materials being separated: and selective condensation of the metals from mixed vapors. Results:

- Simple distillation did not separate the metals, though the vapors were to some extent enriched.
- Fractional distillation provided a partial separation, producing material of better than 90% purity, but requiring recycling of more than half the metal.
- Selective condensation did by far the best job. With careful regulation of the temperature and proper baffling of the condenser, more than 80% of the material obtained was of better than 98% purity, requiring minimum recycling. —ARG

DEVELOPMENTS TO WATCH...

World-wide

Titanium brazing alloys in foil form . . .

. . . are coming from Imperial Chemical Industries Ltd, London, England. These are described as a group of materials "substantially of eutectic composition," the melting point of which can be varied so two or more parts can be joined to the same component by successive brazing operations.

A typical composition is 62% Ti, 28% Ni, 10% Cu; but 28% Ni, 40% Cu or 28% Co alloys may also be used. The alloys are rolled to foil 0.010 to 0.012 in. thick, and placed between the components to be joined. They melt at about 1800 F.

The alloys can also be supplied in rod form—by filling a tube of one of the materials to be joined with the eutectic powder composition.

Friction machining is receiving new attention in the USSR . . .

. . . with production equipment being designed and new studies made of the cutting mechanism. Special attention is being given to air-cooled wheels.

One application, described in a Soviet technical publication, is in machining cast-iron parts. When they are brought into contact with a metal disk rotating at high speed, the heat of friction melts the cast iron; while, the Soviets say, rotation of the disk produces a continuous air current that cools off the adhering metal droplets, giving the disk a rough and grainy surface that acts, in effect, as a grinding wheel. This grainy surface is, of course, worn away; but is re-created at the start of each machining cycle.

Brushless alternator designed in Scotland . . .

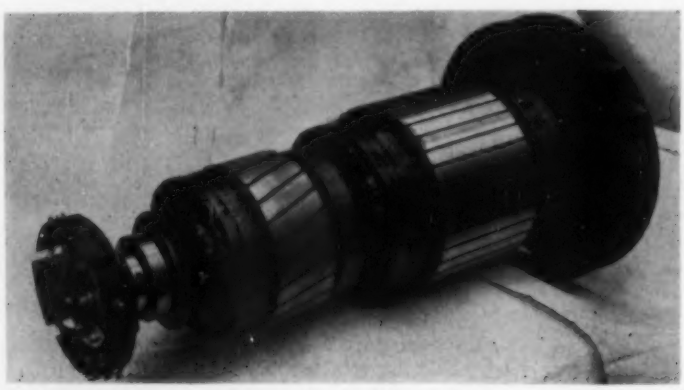
. . . features a rotating silicon-diode rectifier unit, air-cooled by speed of its own motion.

As the manufacturer, Macfarlane Engineering of Glasgow, describes it, the alternator is of the revolving field, non-salient pole type; and it provides automatic voltage regulation within plus or minus 1½% of the selected voltage from no load to full load.

In the new unit (see photos), the alternator field is supplied by an exciter which is itself a small revolving armature machine, supplied by a transistor preamplifier. The 3-phase output from the exciter is fed directly to the rectifier which rotates with the shaft, and dc output of the rectifier supplies the main alternator field through cables in the center of the shaft. Thus, there is no need for brushes, sliprings, or commutators.

The unit pictured below is to be made in ratings from 10 to 150 kva, in several voltage ranges and frame sizes.

(Note: Brushless alternators have also been designed in the US, but differ in size and other respects from this one. In Britain, too, at least two other companies are said to be working on brushless alternators; and on generators as well.) —ARG



Rotor assembly consists of rotating rectifier, revolving exciter-armature and revolving field alternator. Entire unit rotates at 1500 rpm, will work at temperatures to 250 F on the cooling fins.

Closeup shows rectifier unit mounted on exciter shaft. It has 6 silicon diodes mounted on base plate.

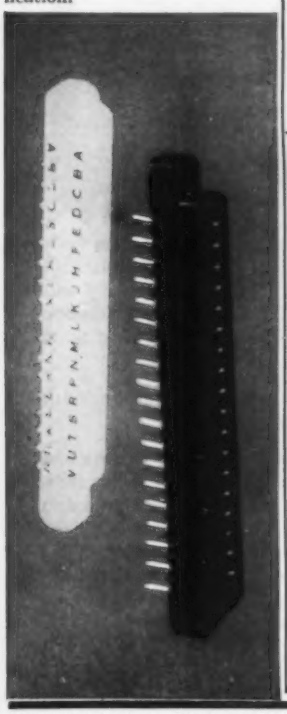
Plaskon Nylon News

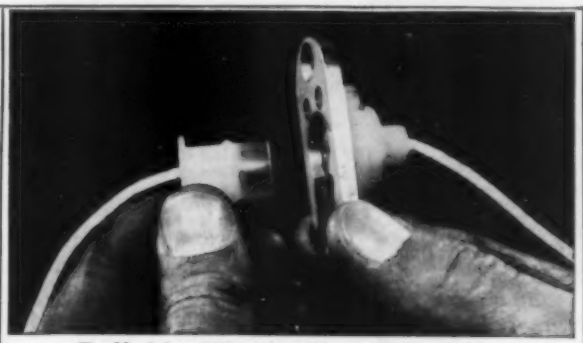
Type 6 • Nylon's Range of Applications Expands!

MORE AND MORE INDUSTRIAL AND CONSUMER PRODUCTS MAKE USE OF ITS OUTSTANDING PROPERTIES

Durable Electrical Circuits

Space Products, Long Beach, Calif., uses flexible Plaskon Nylon 8200 for circuit connectors because it produces higher uniformity of finished parts yet lowers manufacturing costs. These "Ezi-Connectors" feature beryllium contacts, with a fatigue resistance twice as great as that of spring brass or phosphor bronze. They are moisture-proof and can be easily and repeatedly inserted and removed. Available in several colors, they are lettered to permit easy assembly and identification.





Reliable Missile Fire Connector

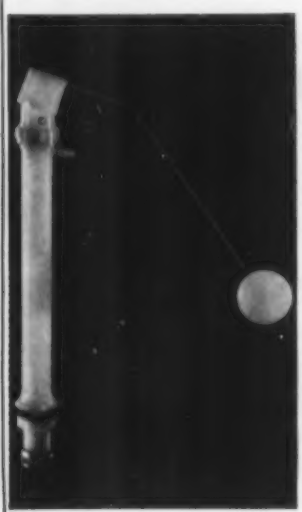
Plaskon Nylon 8200's outstanding durability, light weight and resilience are put to good use in this missile fire connector. Injection molded nylon provides excellent insulation and seal against contaminants and moisture for the connector's contacts, as well as mechanical protection for the unit itself. The manufacturer, Alden Products, Brockton, Mass., reports that Plaskon Nylon 8200 enables him to achieve the highest compactness and reliability for this vitally important missile component.

High Strength Closures

This smooth, lustrous Plaskon Nylon cap nut will not scratch, snap or tear other surfaces as do metal caps. Ideal for use in the furniture and electronics industries, the "Relok" Nut is rust-proof, antimagnetic and self-locking. Plaskon Nylon's high strength and impact resistance enable it to withstand rugged duty. The Lehigh Metal Products Company, Cambridge, Mass., supplies the "Relok" Nut in several lengths and colors.

Superior Ballcock Valve

The Hydo Valve Corporation, Austin, Texas, manufactures this ballcock toilet valve with injection molded Plaskon Nylon 8200. The valve's superior action cuts water closet fill time in half and eliminates noise and seepage. Plaskon Nylon is ideal for products of this type because of its high resistance to heat, chemicals and abrasion. Also, nylon's light weight produces a more compact unit, which can be more economically stored and shipped.



Extra Extrusion Economy! Plaskon Nylon Extrusion Compound 8205 maintains high-melt viscosity through successive regrinds. Scrap can be re-extruded several times without the slightest deterioration of basic properties.

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10,000 P.S.I.

4 WAY VALVE

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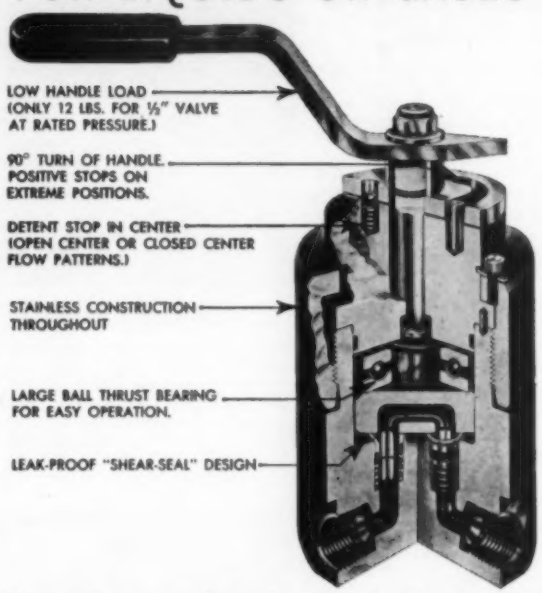
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LEAK-PROOF "SHEAR-SEAL" DESIGN

This new four-way valve series comes in pipe sizes from ¼ to 1 inch, but may be obtained with tube, AND 10050, or any preferred special high pressure connection. It will withstand surges of up to 15,000 P.S.I. without damage to the valve's sealing qualities. It is designed for a burst pressure of 30,000 P.S.I.

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Long, maintenance-free service is assured because the optically flat metal to metal sealing surfaces of the sealing rings and mating rotor faces are protected by staying in constant intimate contact; flow is always through the center of the "Shear-Seal", never across sealing surfaces (as in conventional valve design). Sealing qualities actually improve as the self aligning "Shear-Seals" lap themselves to a more perfect fit with each valve operation.

Of course, there is no external shaft leakage, because the pressure is confined to the flow passages.

Write for Catalog 59-60

CONTROL VALVE DIVISION

Barksdale valves

5125 ALCOA AVENUE • LOS ANGELES 58 • CALIFORNIA

DEVELOPMENTS TO WATCH...

Washington

Major change in Army field equipment . . .

is on the way. The new concept, borrowed from industrial heavy-construction equipment, is featured by: single, large-dia, low-pressure tires instead of multiple-tire arrangements; a return to powered-wagon-type steering arrangements; and simple exo-skeletal designs that stress the skin of a vehicle, rather than a frame with a body added. Army calls the vehicle "Goer."

Initial performance of two 15-ton test vehicles—a cargo truck and a 5000-gal. tank truck—is now under evaluation. At a recent demonstration held at Fort Knox, Ky, Army's chief of Research and Development, Lt Gen A. G. Trudeau, called the equipment "the finest exhibit of off-road mobility I have ever seen."

His reaction typifies Army enthusiasm over the equipment. Le Tourneau-Westinghouse assembled four of the 15-ton vehicles for the Army from off-the-shelf parts at a cost of around $57,000 each. Two 1-ton vehicles are due for delivery in October. And Army has included money in the 1961 budget for more of the equipment.

Some Army spokesmen envision an entire family of field vehicles ranging from giant-size cargo and missile toters to small, utility, gondola trucks.

Advantages of such vehicles over conventional vehicles of similar size and power are: much superior mobility—the Goer conquers terrain that stalls conventional vehicles; higher payload-to-gross-weight ratio; greater simplicity and durability with less maintenance.

In addition, construction of the vehicles gives them inherent floatability. The 15-tonners can cross lakes or rivers at around 3-knot speeds from tire action alone. Plans call for increasing this speed with water jets or a propeller.

Basic military research spending . . .

is expected to double next year—fiscal 1961. That is what one top Pentagon official has said in private talks. And a big chunk of the money will go into Navy's anti-submarine warfare program. Right now, the military is spending around $75 million on basic research out of some $4 billion to $6 billion going into the over-all research and development programs.

There will be other changes in the upcoming budget too. Missile expenditures are expected to climb another $1 billion—up to the $5 billion level. Aircraft expenditures, however, will slide below the $6-billion level for the first time since Korea.

Cuts are slated for aircraft research and development too. Projects such as the B-70 bomber to fly at Mach-3 speeds at 70,000 ft will be stretched out. Some even predict the bomber may eventually be canceled altogether. It is all part of the squeeze that the military is undergoing as it tries to hold the line on expenditures at a time when costs continue to mount at an alarming rate.

Critical of NSF's lagging scientific manpower program . . .

the House Space Committee has directed National Science Foundation to submit a report on its immediate program when Congress reconvenes in January.

The committee scored NSF as "a victim of its own caution" in establishing a comprehensive manpower register which government and industry could draw upon in an emergency. It pointed out that the agency is devoting less than 1% of its budget to the entire manpower program, including the register.

The foundation has made the beginnings of a register by collecting membership lists of various professional societies on IBM cards but admits that the program is inadequate.

Measurement Milestone Reported by NBS . . .

American instrument-makers are now a big step closer to their goal—accuracies of at least 1 part in 10 million and certified by a regular gage-block calibration service handled by the National Bureau of Standards.

For the first time in history, the NBS has certified accuracy of its length measurements—to better than 1 part in 5 million—on a pair of commercial gage blocks.

Two blocks—one 16 in., the other 18 in.—were checked against US line standards, and by wavelengths of light method, to within one millionth of an inch. Results obtained by the methods agreed satisfactorily with both gage blocks.

Six ways to find an atom

How many methods for detecting radioactive materials? It's well known that activated atoms are easy to trace. But the number of ways it now can be done forms an impressive array.

In a talk to the ACS, H. H. Seliger of National Bureau of Standards rounded up half a dozen methods, ranging from Cerenkov radiation to scintillation counters.

Here's his list:

- **Cloud chambers** in which the radioactive atoms produce ionization tracks along which particles of vapor condense in visible lines.
- **Photographic emulsions,** "developed" by high-frequency electrons.
- **Photo-conducting crystals,** made to produce displacement currents by radiation which changes the electron energy levels.
- **Gas counters,** in which ions are separated by the action of an electric field. The magnitude of the field gradient determines whether the counter operates as an ion chamber, proportional counter, or Geiger counter.
- **Scintillation counters** – gaseous, liquid, or solid–in which fluorescence produced by radiation in turn produces photoelectrons in the photocathode of an electron multiplier phototube.
- **Cerenkov radiation,** the visible glow produced by radiation that outspeeds light in a liquid medium.

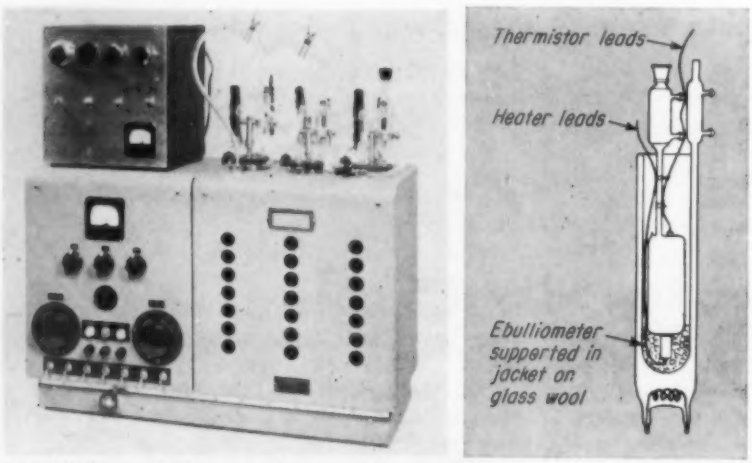
When to use which? As Seliger points out, the specific choice depends on sensitivity and efficiency, simplicity, reproducibility, and availability. Gas and scintillation counters usually get the nod because the detector response is a charge pulse, already in proper form for electrical analysis. But each of the others has its place and is worth investigating.

Tiny tattletales

Microanalysis, once the province of the research chemist in soft-goods industries, is rapidly moving into the area of manufactured products.

As P. L. Kirk of the U of California pointed out to the ACS national meeting, corrosion can be detected in critical equipment when only a tiny amount of the corrosion product has formed, and designs can be changed before serious accidents occur. Airplane failures can be reconstructed and interpreted by analyzing small places of wreckage this way.

Microchemistry itself is a relatively new development. Basing analyses on milligram sampled has called for much new equipment. One example is the micro-ebulliometer pictured here (That's a big name for a little thing. *Ebullition* is just a $10 word for "boiling.") Martin Dimbat and Fred Stross of Shell Development Co designed it for molecular weight studies.



Baby boilers, with thermistors for temperature measurement, can analyze samples as small as 1 mg. Diagram, from ACS report, shows boiler construction.

When heat and radiation get together

The strange effects of radiation, heat, and pressure on materials are highlighted by graphite research.

Under normal conditions, temperatures to 900 F have little or no effect on this refractory material. Likewise, at normal temperatures, nuclear radiation has little effect.

But, say engineers at the AEC's Hanford operation, Richland, Wash, put the two together, and the material starts to shrink. At temperatures of 800 to 900 F, the shrinkage is minimal; but the higher the temperature goes, the greater the shrinkage. Tests now in progress indicate contractions in the range of 0.1 to 0.15% at 100 F; and over 1% by the time the temperature reaches 200 F. Further studies are planned, aimed at explaining and counteracting this effect.

Meanwhile, at U of Buffalo, the thermal conductivity of polycrystalline graphite at temperatures from 2000 F to 5000 F has been under investigation, at normal and reduced pressures. And here, again, unusual effects have been found.

Says H. E. Strauss of UB: In the high-temperature range, the thermal conductivity of porous graphite seems to be pressure-dependent. A decrease in conductivity is found as pressure in the test chamber is reduced. On the other hand, tensile and compressive stresses seemed to have no effect on thermal conductivity. –ARG

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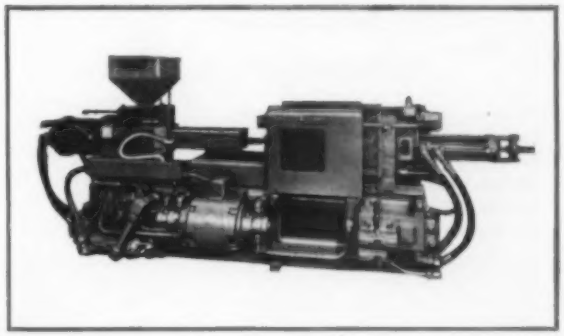
FOR EXAMPLE, the Reed-Prentice injection molding machine, shown at right, had been using a standard 40-hp motor. By ECONO-MATCHING, G-E engineers determined that a smaller, lighter, more compact 30-hp motor with improved electrical characteristics could do the job required. Although this special 30-hp motor cost slightly more than a standard 30-hp, it provided greater efficiency and cost considerably less than the 40-hp motor it replaced. It also cut space and weight requirements. G.E. has also ECONO-MATCHED motors for crane, compressor, and other applications.



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Picture changes on nature's stockpile

We have a lot more lead and bismuth than was previously supposed, but a good deal less iron, tungsten, zinc, germanium, titanium, and zirconium, says Dr A. G. W. Cameron of Canada's Atomic Energy Authority. On the basis of nuclear studies, he's made a number of revisions in the table of element abundance prepared by Suess and Urey in 1956—and some of the changes are important.

The Suess-Urey table was based primarily on analysis of chondritic meteorites and incorporated the premise that the abundances of odd mass number should lie on a smooth curve.

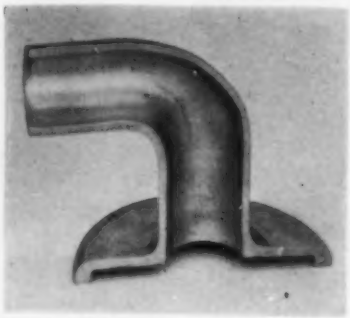
But, Cameron finds, relative abundances in meteorites are not as good an indication of natural abundances—even in the universe, much less on earth—as was thought; and the smooth-curve idea is somewhat limited in application.

In a table prepared for *Astrophysical Journal*, Cameron cites comparisons like these shown below. (In both cases, the reference point is silicon, which is given an abundance of 10^6.)

Element	Relative Abundance	
	Cameron	Suess-Urey
Titanium	1680	2440
Iron	8.5×10^4	6.0×10^5
Zinc	202	486
Germanium	25.3	50.5
Selenium	18.8	67.6
Columbium	0.81	1.0
Cerium	0.6	2.3
Hafnium	0.1	0.4
Tantalum	0.1	0.6
Tungsten	0.1	0.5
Lead	21.7	0.5
Bismuth	0.3	0.1

Copper, frequently used as a reference point for the metals (*PE*—Mar 17 '58 p 66) is 212 on both scales. Aluminum is 9.5×10^4 and magnesium is 9.12×10^5.

Note: New figures on all the metals as compared to copper, will appear in this section in a forthcoming issue.



Cored forgings can turn corners, says Bridgeport Brass Co, and shows this example to prove it. It's a bracket made from a round billet in a 200-ton coring press. This particular bracket has a flange dia of 3½ in. and tubing 1 in. in dia with a ⅛-in. wall. Both flange and tubing diameters can, however, be varied.

Our own glossary: VI The "natural" rubbers

They're still not in volume production, and some are available only on a developmental basis. But the "natural" synthetic rubbers are making progress and have proved remarkably similar to the genuine article. Here's a rundown of those now obtainable, and the names of the producers:

Coral: Firestone
Ameripol SN: Goodrich
Natsyn: Goodyear
Polyisoprene: Shell

All of these, incidentally, are grouped under the general ASTM designation IR (isoprene rubber), in the system in which the general-purpose synthetic, formerly labeled GR-S, becomes SBR (styrene-butadiene rubber); and natural rubber has the designation NR (see *PR*—Jan 26, p 13).

Another set of initials cropping up with increasing frequency in connection with polyisoprene rubber is CPI. The "C" in this case refers to the structural configuration of the molecule, and stands for the prefix cis. (The PI, of course, stands for polyisoprene.) Polybutadiene, also under test as a substitute for natural rubber, and also showing considerable promise, is likewise sometimes known as CPB. These are not, however, official designations. (In the proposed ASTM system, polybutadiene rubber is BR.)

How prices are changing: Metals:

While all eyes have been on the Big 3 (steel, aluminum, and copper), the lower-volume metals have been making price news of their own—and mostly on the "up" side.

At the end of the third quarter tin, lead, zinc, and foreign silver were all well above their year-ago levels, though not all at this year's summit. The price of foreign silver, for instance, after a steady rise from last year's low, reached 91⅜¢/oz on Aug 28 (3¢/oz above its position a year earlier); then slumped slightly to 91⅛. Tin went up 4¢/lb in last year's fourth quarter; then went over the $1 line, to $1.05 in February. Since then, it has dropped back a little, to $1.02⅛.

briefs . . .

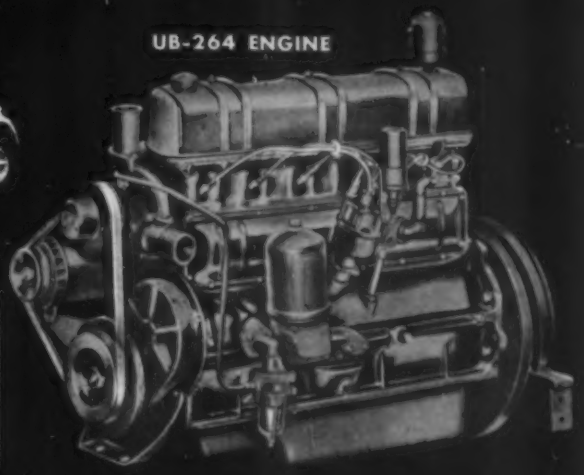
New resistor alloy said to combine high resistivity (815 ohms/circular-mil-foot) with a low temperature coefficient of resistance has been developed by Hoskins Mfg Co, Detroit. It's basically an iron-nickel-chromium composition. But the company claims it has "exceptionally uniform physical and electrical properties", high strength, and a corrosion resistance "equivalent to the more costly 80-20 nickel-chromium alloys."

Tiny heavy metal balls that can be used to fill odd-shaped cavities or provide an adjustable counterweight come from P R Mallory & Co, Indianapolis 6, Ind. Made in sizes from ☆ to ¼ in. dia, they can be "poured like sand or pumped to fill a volume of any shape." (Note: for detailed information this tough, high-density tungsten-nickel-copper alloy, see *PE*—July 21 '58, p 62). —ARG

CIRCLE 15 ON READER SERVICE CARD→

6-cyl. UB-264 carbureted engine, 153.5 hp @ 3,800 rpm, provides prime power for 4 cu yd Elgin Street King sweeper, is used as pump power on the Elgin Eductor that cleans catch basins, manholes and sludge pits.

UB-264 ENGINE



Why Elgin Sweeper Company specifies International power in 3 products

Robert Schmidt, Chief Engineer, Elgin Sweeper Co.

Robert Schmidt, Chief Engineer, Elgin Sweeper Company, specifies International 6-cylinder carbureted engines 100% for the three Elgin products shown here, and he gives these reasons why:

"We selected International BD-240 and UB-264 engines for our requirements because we needed heavy duty engines with superior sealing that would keep working under extremely dusty conditions.

"Our customers tell us these International engines keep our machines operating whenever there's work to be done, and they like the availability of International parts and service to be found in both small and large communities."

When your next products advance to the design stage, check into the complete International engine line—14 carbureted models, 10 diesels with a power range of 16.5 to 385 max. hp. You'll like the one common feature of all 24 engines: Fastest payback power for users. Just call or write International Harvester Co., Engine Sales Dept., Construction Equipment Division, Melrose Park, Illinois.

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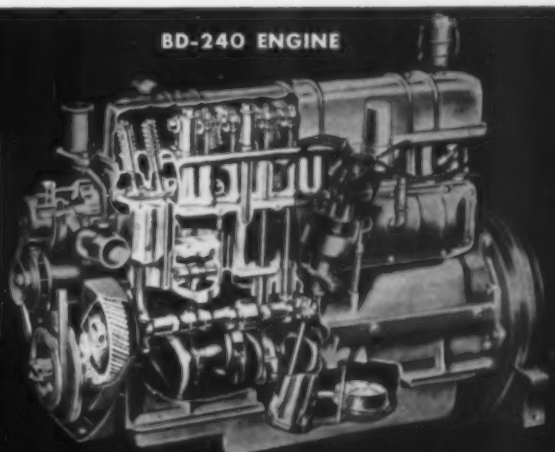
Elgin White Wing, "America's foremost 3 cu yd motor pick-up sweeper," is driven by 6-cyl. BD-240 engine with 140.8 hp @ 3,800 rpm.

BD-240 ENGINE



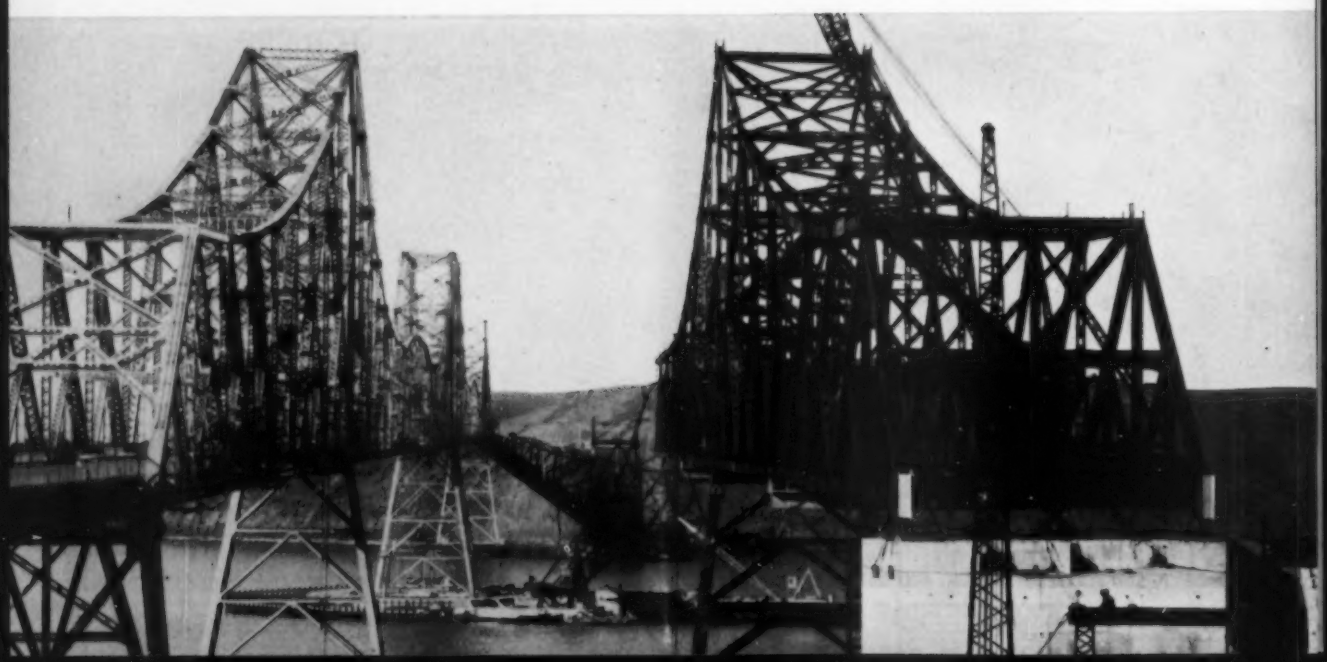
Jointly, We've come a long way since man first found that he could unite pieces of metal by

No matter what technique you use, the finished joint is best when the welded material is steel.

STEELS FOR DESIGN

beating them together while they were hot. Now there are almost 40 different welding techniques.

Above, you see a close-up photograph of arc-welding. For a more complete picture of welding, turn the page. ▷ ▷ ▷



STEELS FOR DESIGN

Stainless Steel makes a flawless milk can—Milk cans have to be surgically clean. That's why the John Wood Company makes them from Stainless Steel, with **welded** joints. Here, you see a "Heli-arc" welding machine that was specially designed to weld the inside bottom and outside bottom of the can in one operation. The welding head is retracted to the breast of the can where again, the inside and outside welds are done in one operation. A nipple is gas-welded to the bottom of the can and all the joints are polished to a mirror finish—ready to pass microscopic inspection. Because of the outstanding design and fabrication processes developed by this company, they are now equipped to produce 50% of all the Stainless Steel can requirements for the entire dairy and vending machine industries.

USS "T-1" Steel stops saddle block failure—A saddle block links the dipper stick to the boom of a power shovel (see arrow above) and provides the digging effort. It has to withstand tremendous stress and shock—failures are not uncommon. But one operator had too many saddle block replacements so he asked J. B. Lund's Sons Co. to make a stronger unit. The conventional solid cast steel or forged steel block would have been too vulnerable, so the additional strength had to come from a **welded** assembly of strong steel plates. But the higher carbon content that increases the strength of most types of steel also decreases the weldability. They solved the dilemma with USS "T-1" Constructional Alloy Steel. "T-1" brand is a **low** carbon, quenched and tempered alloy steel with tremendous strength—100,000 psi minimum yield strength. The photo shows the finished block made from "T-1" steel plates that were edge-welded 1¼" deep. This block has never failed.

High Strength Steel cuts dead weight—You can stand beside the Carquinez Strait in California and size-up thirty years advancement in bridge building. There are two spans there, side-by-side; one is 31 years old, the other was completed last year. The builders of the new span saved 2,128 tons of steel because they designed the new Carquinez Strait Bridge with USS TRI-TEN High-Strength Low-Alloy Steel and USS "T-1" Constructional Alloy Steel. With yield strength levels of 46,000 psi min. and 90,000* psi min., respectively, these ultra-strong steels permitted thinner, lighter truss members that were shop-welded instead of riveted. 100% efficiency butt welds saved 20% in the weight of tension members by providing extra material at the holes for the connection bolts. The smooth, rivet-free surfaces are less vulnerable to corrosion . . . save thousands of dollars in maintenance.

USS, "T-1" and TRI-TEN are registered trademarks

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*Now 100,000 psi for plates up to 2½ inches.

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THE RAW MATERIALS OF PROGRESS

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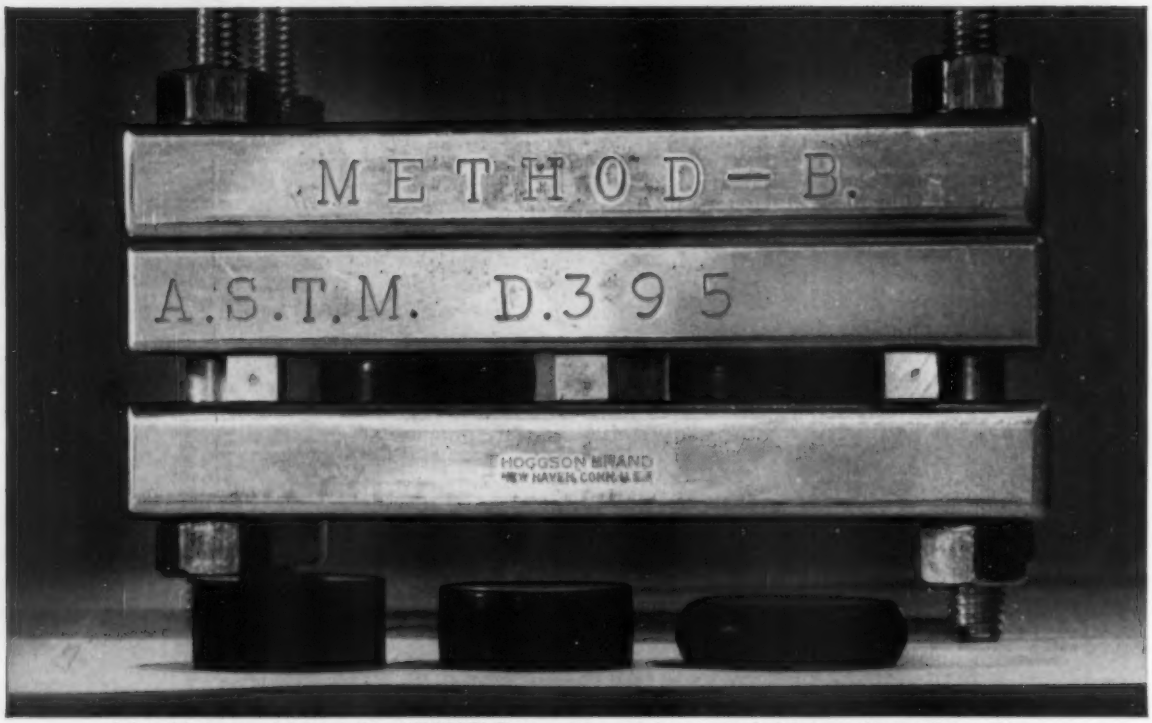
BRAND ELASTOMER

Shrugs off heat and compression set



Left to right foreground: half-inch discs of FLUOREL Elastomer before and after test; standard elastomer after test. Test conditions: 25% deflection for 70 hours at 350°F. FLUOREL Elastomer will set only 30% of original deflection when released.

FLUOREL Brand Elastomer is a highly fluorinated synthetic rubber that maintains excellent resistance to compression set, even at extreme temperatures. A half-inch disc of FLUOREL Elastomer, for example, deflected 25% for 70 hours at 350°F, will set only 30% of the original deflection when released.

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CHEMICAL DIVISION

MINNESOTA MINING AND MANUFACTURING COMPANY

. . . WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

Product Engineering HORIZONS

October 5, 1959

THE BIG "I" IN DESIGN

"What a good boy am I!" So bragged Jack Horner, pulling the plum out of that Christmas pie. Do you seem to hear that old nursery refrain as you look at some architectural extravaganza that expresses primarily the personality of the architect, or some impressionistic painting or sculpture that defies lay analysis and almost sneers at hoi polloi observers?

How often is the same attitude evident in the high-level engineering or scientific paper? Or in the product designed primarily to express the "personality" of the designer? How often do they go beyond necessary facts or structures to parade the egotism of their creators?

Now, let us not condemn egotism summarily. It's the necessary knot to keep a stiff spinal cord on the innovator, the necessary ingredient in creativity. The creative mind must steel itself against the ridicule and disbelief of the conventional world, because the really new idea must be built upon the rubble of an accepted "law." Unless there is independence of thought, sublime egotism, and willingness to defy convention, the new concept will die a'borning.

But it's a hard economic law that creative minds cannot subsist indefinitely on moonbeams and stardust; sooner or later an outraged stomach demands solace, just as it does in ordinary mortals. Then even the creative mind must acknowledge that products are bought by people.

In plain English—if you can't sell it, you don't eat. To that extent, this mundane world has us all at its mercy. Despite the legends of genius starving in a garret, there is plenty of evidence that even genius on occasion has descended to potboiling production to get something into the pot. Sooner or later, the single "I" centered in "designs" (and in "pride") must give way to the two wide-set I's in "engineering," even to the little "i" that follows the big "U" in "production."

This is probably the major problem of the idea man, to shift from the "I" to the "you." In these recent years, demand has been so great that it seemed hardly necessary to consider the "you" at all, and a great many of our products reflect that attitude. But, sooner or later, the buyer gets back into the saddle. The product must be saleable; the idea must incorporate enough animal magnetism to attract moneybags. That's what's happening right now.

This is a rather distressing concept to any designer, be he innovator or simply improver. It is axiomatic that his first pure design is always the favorite of its creator; the second, often watered down by superiors, financiers, or product-planners, loses some of the really fascinating features, but begins to appeal to the customer. And the third! That one has fewer parts, but has production potential, "sales features", almost hides its innovations, and may turn the designer's stomach—but is far more likely to fill it.

The cold facts are that the creator must, willy-nilly, cater to the customer, and the customer is herd-bound most of the time. It isn't enough to get a new idea; it must be a new idea that is not *too* different from present ideas, so it will appeal to the customer, fill a need, and make him buy. Sometimes the real idea, the tremendous advance, must even be masked temporarily by sales features that give the product a "familiar look"—be it teardrop, square, or finned. The designer can eventually arrive at his complete idea, but it must be done by bringing a conventional, resisting buyer along, step by faltering step.

NEW WOUND FIELD MOTORS / VERSATILE

Precision miniature wound field d.c. motors in five basic frame sizes (to 2¼" OD and to 1/10 hp) and in countless variations are now available from Globe Industries. You can design them into many military and other high quality products because they meet such an enormous variety of power and duty requirements. **Examples:**

Split-series units reverse rapidly and simply with a SPDT switch. Series units start with relatively high torque, low current drain. Shunt wound varieties offer means for low current control. Universal motors operate on a.c. or d.c. Globe-designed gear reducers, brakes and clutches can be built into the unit, and Globe can efficiently design and build the motor and accessories into a special motorized device.

If you'd like to look into miniature wound field motors of **any** description, or combine them with other components, ask the largest manufacturer of precision miniature motors first. Request technical Bulletin WF-1. GLOBE INDUSTRIES, INC., 1784 Stanley Avenue, Dayton 4, Ohio.

GLOBE INDUSTRIES, INC. GLOBE

THE ENGINEERING WEEK

Ford's Falcon

Chrysler's Valiant

Chevrolet's Corvair

It's Now Up to Buyers—Compact vs Small Cars

NEW YORK—The beginning of an answer to the burning question—whither the American compact car?—is emerging with recent unveilings of Ford's Falcon, Chevrolet's Corvair and Chrysler's Valiant.

Confusing to experts who try to predict the outcome is the fact that none of the Big Three offerings are competitive in price with the foreign "economy" models. In addition, US compacts are, dimension-wise, still about 15% bigger than the average foreign small car.

Among themselves, Big Three "small" models do not differ drastically in basic dimensions; wheel base, over-all length, height, width, weight (dry), and tread (front and rear). All three are equipped with unified bodies. All have 6-cyl, air-cooled engines. All claim to obtain an excess of 30 miles per gal. of gasoline.

Major differences are mechanical and include: Corvair's engine—at the rear; Valiant's engine will be canted at a 60° angle from the horizontal; Falcon's 90-hp engine is still mostly cast iron while Corvair is all-aluminum except for its cylinder barrels; Valiant will use an alternator to replace the conventional generator, with diodes for rectifiers (this latter is a first in US production).

So far, neither the foreign car makers nor their US counterparts (American Motors and Studebaker-Packard) have expressed any fear that the Big Three compacts will dent their mushrooming shares of the market. Foreign car makers, in fact, are directing their efforts toward producing models larger than their own "small" cars (and more comparable to the US models); they believe that the latter will not suffer in sales from the US compacts.

And there's no confusion in the mind of George Romney, American Motors president, who reasons that the Big Three's compacts will push the so-called low-price cars (Ford, Chevrolet and Plymouth) into the medium-price car field, at least in the customer's minds.

He admitted that American Motors' 100-in. wheel-based Rambler American will be in direct competition with the 3 new compacts. But the 108-in. Rambler 6 and 8-cylinder models and the 117-in. wheel-base Ambassador are in a price and size class which has no competition. He minimizes the impact of Detroit's compacts. ■

New Process Sinters High-purity Silica

CORNING—A new twist to slip-casting and dry-pressing, applied by Corning Glass Works, now gives large, complex parts (photo, below) of high-purity silica.

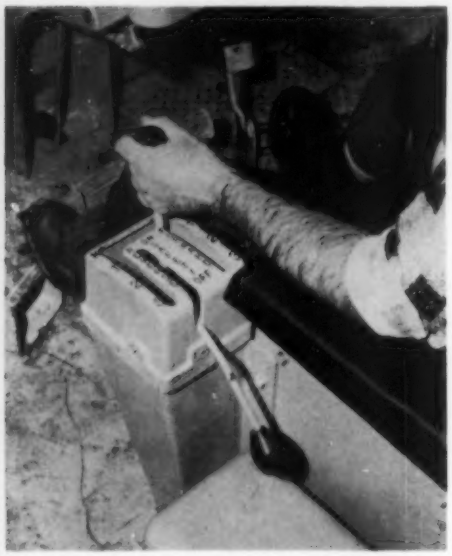
Corning engineers report that devitrification—bugaboo of high-silica glass manufacture—is avoided in the new process, and that new methods (Corning won't describe them in detail) of controlling the tendency of high-purity silica to crystallize, when fused, now makes sintered parts commercially feasible.

A sintering process is essential since high-purity silica requires extreme temperatures for reasonable flow, ruling out conventional forming. Starting with finely ground pure silica, the slip-casting or dry-pressing is shaped into a fused part with impurities as low as one part per million—an important factor in electrical and chemical applications. Physical properties of the sintered-silica form are very similar to those of fused silica, the parent material. Mechanical properties are reduced 50% (see chart).

Corning hopes to exploit the new technique in high-speed flight vehicles where sintered silica's thermal and electrical properties may be helpful. With its improved formability, the material will be in the same structural family as the company's recently developed glass-ceramic, Pyroceram. ■

Glass Properties Compared

Properties	High-purity Silica		Pyroceram 9606
	Conventional	Sintered	
Specific gravity	2.20	1.96	2.60
Porosity, %	0.0	9–13.6	0.0
Service temp, °C	1200	1200	1000
Expansion coeff., per °C x 10^{-7}	5.5	5.5	57
Thermal conductivity, cal/sec-cm^2-°C/cm	0.0028	0.0022	0.0087
Modulus of rupture, psi x 10^3	10	5.0	24
Modulus of elasticity, psi x 10^6	10.5	4.7	17.3
Dielectric constant	3.76	3.58	5.45
Loss tangent, x 10^{-4}	1.7	6.9	3.3



Tractor Equipped with Power Shift Transmission

New Caterpillar tractor series model, available in a choice of direct or torque converter drive (as well as power shift version), is equipped with turbocharger which increases machine horsepower from 320 to 325 hp. Undercarriage of the tractor, designated Caterpillar D9 series E, has been redesigned to increase dimensions, strength in components. Guide for the range selector level, above, is horseshoe-shaped. One leg of the shoe contains (1) intermediate, (2) and high gear (3) in forward; the other leg contains the same ranges in reverse. Neutral is at the curve of the shoe. Rear lever is a manual safety that locks the gear-selector lever in place.

This Cooler Guards Radar at Mach-3

SAN DIEGO—A cooling unit is being tested here for radar receiver-transmitters that have to ride aircraft traveling over three times the speed of sound. Convair's thermodynamics lab developed and is testing the unit for the Navy.

Radar equipment rides inside the cooling case. Ram air goes to work at subsonic speeds. When inlet air reaches 120 F, a thermostat switches the system to evaporative cooling.

For higher speeds and temperatures, heat is drawn from the unit by a thin spray of water that boils off and is released as steam. ■

German Reports Describe Soviet Rocket Guidance

Moscow—Soviet scientists were probably able to control almost the complete trajectory of the rocket that hit the moon. Though little information on the guidance system has been forthcoming from the USSR, East Berlin's *Berliner Zeitung* has carried stories by "rocket specialists" which say that Soviet scientists controlled the final stage until just before its impact on the moon.

According to the Zeitung writers, the guidance system was composed basically of three computers stabilized by gyroscopes. During powered or active flight, these computers measured speed for three flight vectors: vertical, horizontal at right angles to the rocket's course, and horizontal along the rocket's course. Electrical or gyroscopic equipment on board coordinated these three measurements to determine the rocket's speed in relation to the three directions.

Before flight, a guidance program giving three-directional speed for the chosen flight path was fed to the guidance unit. This predetermined program was compared with actual performance, measured by the computers, as flight progressed. Differences were transformed into electric signals that put the rocket back on course.

On earlier rockets, these sources continue, slight deviations in the path of the rocket could not be corrected after the motors burned out. The vehicle then became a passive object like a pebble thrown into space. But recent technical advances now permit small corrections by radio signal from earth.

After motors stop working, these sources say, direction and speed of final stage was signaled back by radio. On ground, differences in receiving frequencies caused by Doppler effect could be translated into corrections by computers and sent back to the final stage. (For information on the guidance system of the first lunar rocket see *PE—Feb 2, p 15.*)

Statements by USSR scientists differ on period of control over rocket. At a press conference shortly after the moon was hit, Soviet space experts implied the last stage was guided until impact was imminent. Now, *Pravda* in a unsigned article to clarify confusion, says guidance operated only through the first few minutes, then a special guidance system operated during acceleration—a period of several minutes. For the next day and a half, flight was unguided.

On one question, though, there is agreement here—more space ventures will be forthcoming. Scientists are saying that they can accurately guide a rocket into space beyond the point where they can receive signals back. Trips to Mars and Venus are now possible, they say, but signals cannot be sent much further than the moon.

Discussing future space ventures, G. Kisunko says "the time has come when piloted cosmic rockets will smoothly touch down on the moon, delivering automatic labs which will carry on scientific observations and report them back to earth." ■

Industry Ups Grants to Higher Education

NEW YORK—In spite of relatively poor business conditions in 1958, US industry donated more to the nation's colleges and universities than they did in 1956. Corporate gifts last year amounted to $52.6 million compared with $33.1 million the earlier year according to the Council for Financial Aid to Education.

The Council, a nonprofit corporation, was founded in 1952 to promote an awareness among businessmen of the importance of higher education and the need for industry to give financial support to it. This is the council's third such biennial survey.

Both the number of donors and the size of their contributions is rising, the council report observes. In 1956, only 293 companies reported gifts to the council; last year 352 did so. For a group of 215 companies that reported in both years, the average gift rose from $104,000 to $109,000.

Most generous donors, the report

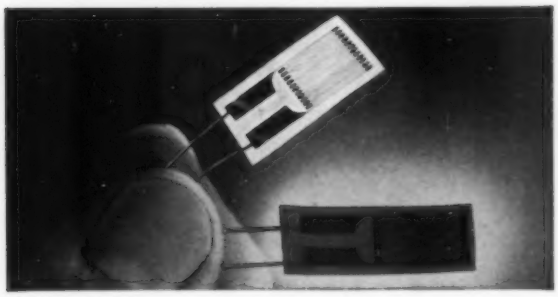
(CONTINUED ON PAGE 26)

Measuring strain?

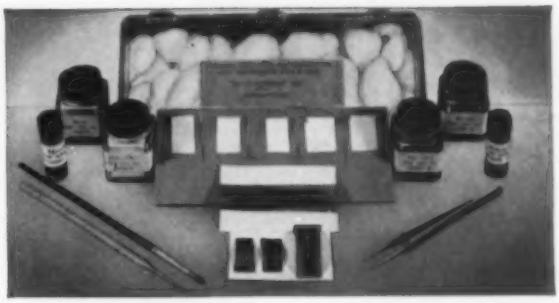
SEE YOUR B-L-H SALES-ENGINEERING REPRESENTATIVE

Your single source for...

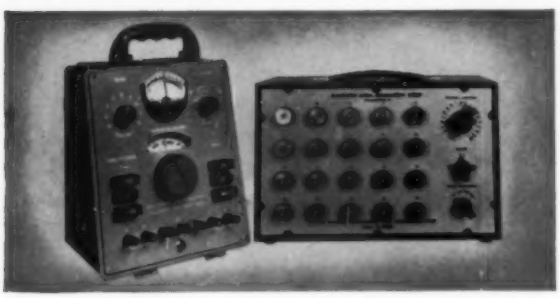
- **Over 250 different bonded wire and etched foil SR-4® Strain Gages**
- **Full line of indicating, recording and supplementary instruments**
- **Application supplies—cements, solvents and waterproofing materials**
- **Competent guidance in the selection and use of strain gaging equipment**



Why risk unreliable data by using *almost* the right strain gage. Select the one exactly suited to your application from the more than 250 different bonded wire and etched foil SR-4® Strain Gages listed in the current B-L-H catalog. High temperature, temperature-compensated, rosette and many other types are stocked by your B-L-H Sales-Engineering Representative for immediate delivery.



The proper application of a strain gage to a surface is fundamental in obtaining accurate strain data. B-L-H cements, solvents, waterproofing and lead materials and accessory equipment help you do the job right. Convenient strain gage application kits contain everything you need, including detailed instructions. Kit materials can also be supplied in bulk form in large or small quantities to suit your needs.



A full line of strain instruments—for static and dynamic strain measurements—is available through your B-L-H Sales-Engineering Representative. Instruments include (left) the B-L-H Type N Strain Indicator, calibrated to read directly in microinches per inch; (right) B-L-H switching and balancing unit, designed to facilitate bridge balancing and gage readout on multiple gage installations.

Write for these useful publications. Bulletin 4310 covers specifications and prices for over 250 wire and foil SR-4® Strain Gages, kits and accessory equipment. Bulletin 4320 treats of SR-4 Etched Foil Gages. For copies, write B-L-H, Dept. 15J. For guidance in selecting, applying and instrumenting SR-4® Strain Gages, contact your nearest B-L-H Sales-Engineering Representative.

FIRST in strain measurement

BALDWIN · LIMA · HAMILTON

Electronics & Instrumentation Division

Waltham, Mass.

SR-4® Strain Gages • Transducers • Testing Machines

(CONTINUED FROM PAGE 24)

says, were firms in the printing and publishing industry. They gave 0.85% of net income before taxes. Average of reporting companies was 0.27%.

The welfare of higher education is also of great concern to our northern neighbors. But Canadian schools did not fare as well as their US counterparts last year. According to the Industrial Foundation on Education, Canadian industry donated $10.4 million to colleges and universities in 1958—a decline of 10% from 1957.

The drop was attributed largely to smaller gifts from foundations that have been set up by industrialists. Direct gifts from corporations amounted to $8.8 million last year compared with $8.7 million a year earlier. Grants from US-controlled firms accounted for 30% of total donations.

Business Equipment Show Dominated by Automation, Electronics

WASHINGTON—A signal from Russia's Sputnik III officially opened a multimillion dollar display of the latest marvels in office equipment here recently. Use of the Soviet satellite signal to key the opening of the trade exhibit was more by accident than an indication of any thawing of East-West relations—the satellite happened to be in a better position than any US satellite to do the job.

The 4-day exhibit was the first to be held by the $4-billion-a-year industry under its newly formed Office Equipment Manufacturers Exhibits, Inc (OEME). Plans call for the group to hold a series of similar exhibits around the country.

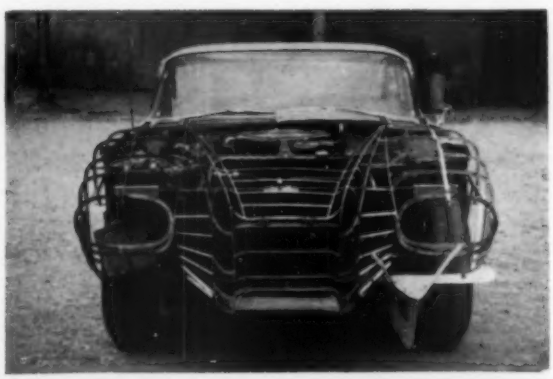
Up for display was virtually every type of office equipment that any well-managed, well-heeled office staff could want. Electronics and automation attractively styled and colored dominated the exhibit. Compact modernization was in ample evidence in

(CONTINUED ON PAGE 29)

50 magnetic-metal disks . . .

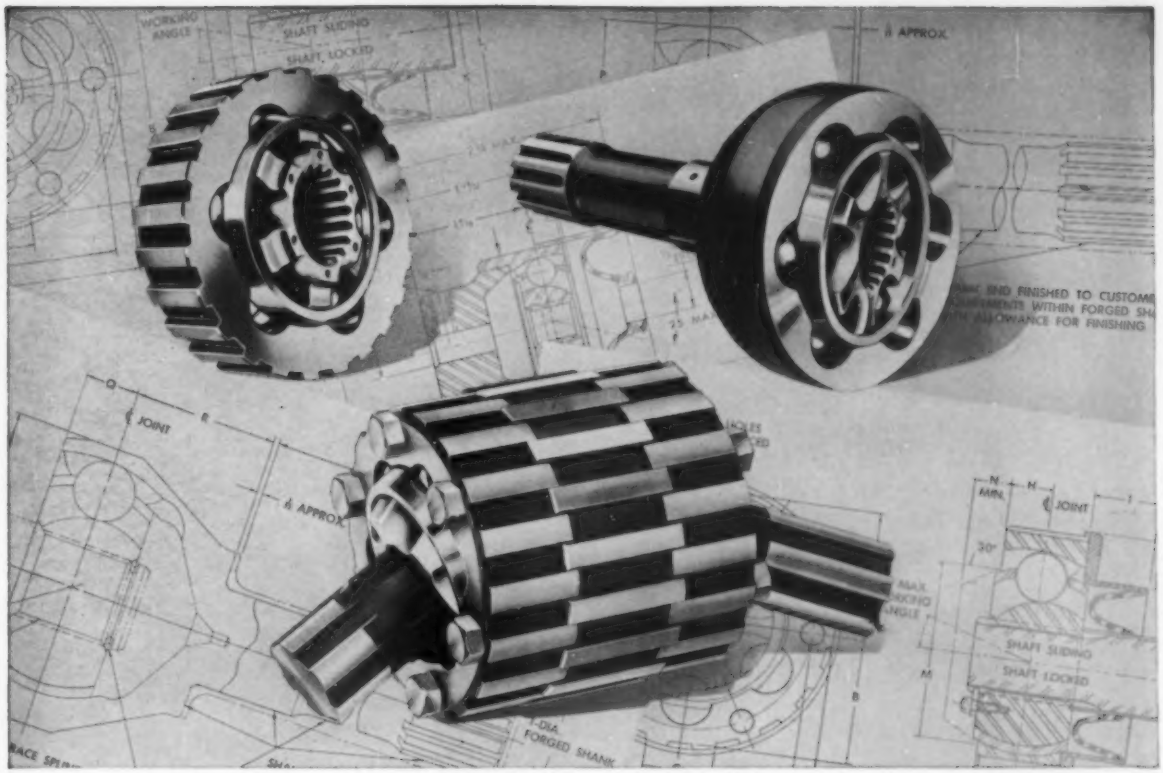
form the storage-unit core of IBM's Random Access Method of Accounting and Control System (RAMAC 305) being demonstrated here at the recent Business Equipment Exposition in Washington, D.C. RAMAC is a complete, compact data-processing system designed to produce "in-line" accounting for all types of business. Data is recorded on or read from each side of the disks in random order by a rapidly moving access arm. Storage capacities of 5, 10, 15 or 20 million digits are available. System has arithmetical and logical ability, punched-card input, and both punched-card and printed output.

Ask the Man Who Designs One:



Here's industrial designer Raymond Loewy's revision of a 1959 Cadillac. This is a significant departure from Loewy's practice of the past 10 years during which time he applied his distinctive body styling treatments to the smaller, sportier European cars (for a previous reaction by Loewy to design of US cars, see the cover of PE—Dec 1 '58). Built in Paris, the car will be displayed at the current Paris Automobile Show. Modification of body design has resulted in a slender, tapered form, reducing width at each end by 14½ in. Air-conditioned main body section has been retained, bottom photos. Loewy eliminates completely the conventional front grille effects. With no visible break in the cowl-to-bumper line, maximum exposure of the engine to air flow is obtained by creating fine perforations in the vertical bore of the hood section, top photos. A secondary air scoop, located under the body line, insures adequate cooling at high speeds. Chrome under the hood emphasizes structural strength of frame and supports; is introduced as material integral to body design. Car was designed by Loewy for his personal use.

CIRCLE 27 ON READER SERVICE CARD→



RZEPPA UNIVERSAL JOINTS Now A Product Of DANA

New Con-Vel Division To Produce Famed Constant Velocity Universal Joints—With These Advantages To You:

- INCREASED SPEEDS
- REDUCED DOWN TIME
- LOWER MAINTENANCE COSTS
- HIGHER CAPACITY

Rzeppa universal joints provide perfectly smooth torque all the time, every time, even at angles up to 35°! Rzeppa rules out bounce, chatter, vibration by keeping the hardened steel driving ball bearings in the correct bisecting plane, no matter what the shaft angle may be. The smoother, constant velocity performance of Rzeppa joints naturally increases shaft and bearing life; adds to over-all efficiency and economy of operation.

Rzeppa universal joints are available in a wide variety of sizes, angles, speeds and styles . . . designed for front drives, articulating axles, propeller shafts, and scores of special applications. For information on their many advantages write to—

DANA Con-vel

CON-VEL DIVISION
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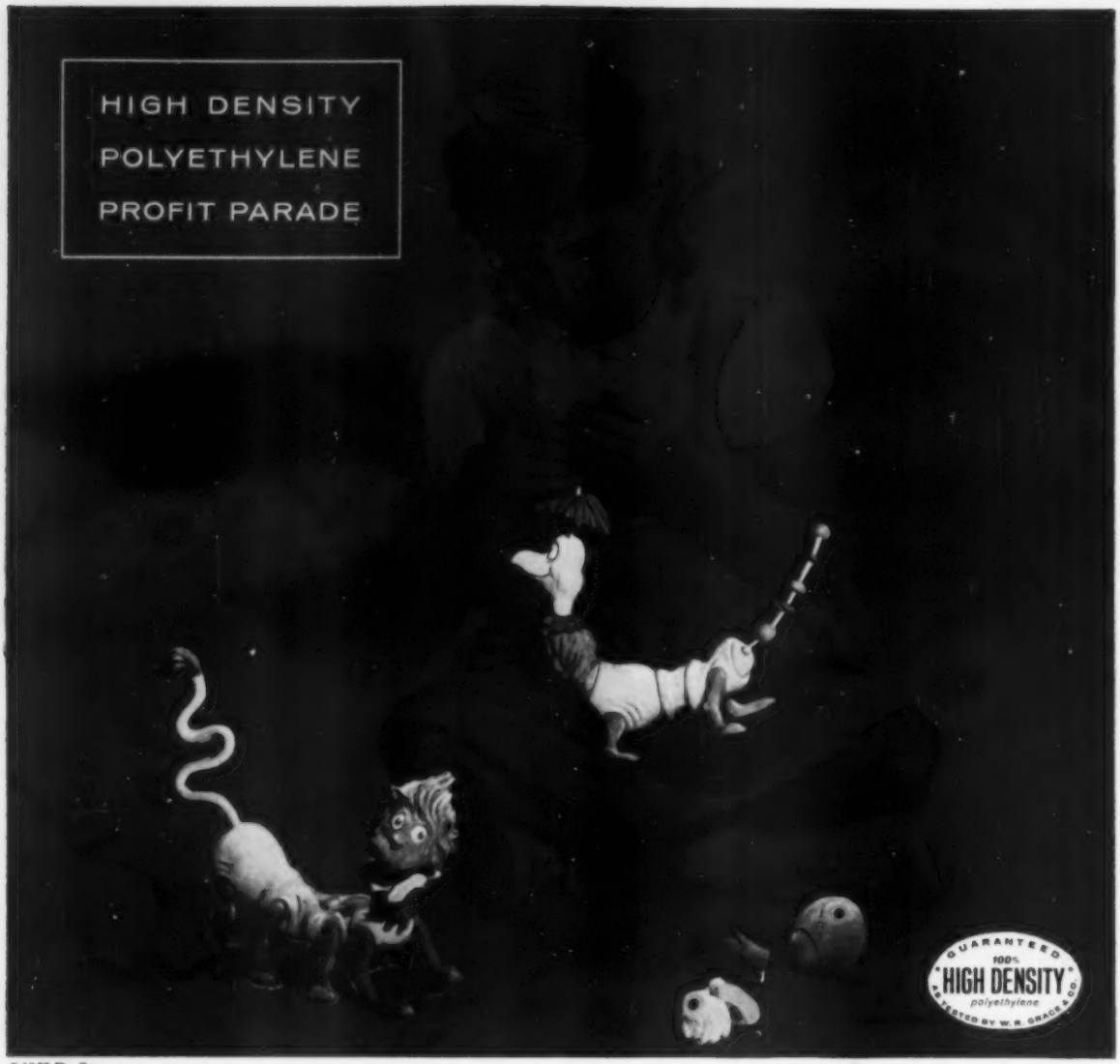


© 1959 Dr. Seuss

Play-proof Properties Spark New Product Idea

Developing a new product? Grex high density polyethylene could stir up as much excitement for you as it's doing for Revell, Inc. Their new product combines the toughness of Grex with the appeal of fantastic animal characters that roam the pages of Dr. Seuss' juvenile books. Sold in kits of interchangeable parts, Dr. Seuss Zoo inhabitants snap together and pull apart in millions of ways—are colorful and strong enough to take the roughest treatment without breaking, chipping or cracking.

There is virtually no limit to profitable new product applications with this versatile Grace plastic. Here are just a few of its advantages: It can be fabricated at low cost and molded in any color. It is a hard, stiff, rugged thermoplastic that takes boiling or freezing without losing its shape or strength.

Find out more about high density polyethylene for the new product you have in mind by calling in the experts. Grace has the production facilities, technical service and experience to help put your product in the Grex profit parade. We're easy to do business with.

Grex is the trademark for W. R. Grace & Co.'s Polyolefins.

W.R. GRACE & CO.
POLYMER CHEMICALS DIVISION
CLIFTON, NEW JERSEY

Quality production of complex parts achieved with fast cycles by specifying Grex.

Here you see 2 of 19 parts that make up Gowdy the Dowdy Grackle. Note their detail, irregularity of contour and how they snap together. In addition to Gowdy, Revell markets three other Dr. Seuss characters that are equally complex. The use of Grex high density polyethylene and substantial technical assistance from Grace helped Revell solve design and molding problems for this project. You can expect the same kind of benefits by working with Grace.

Design requirements of these Revell toys called for rigid parts with high impact strength. Resiliency was also needed to make snap plugs or poppets practical devices for snapping the parts together firmly and pulling them apart easily. Grex combines all three properties required—rigidity, high impact strength and resiliency. And the fact that the most intricate details can be molded with Grace's plastic provided freedom in reproducing these fantastic characters in three-dimensional shapes as suggested in Dr. Seuss books.

Mold layout and production. Revell's two molds for Dr. Seuss toys are among the most complicated ever used with Grex. They contain over 60 cavities; each cavity has an irregular parting line and many have serious undercuts. Stripping the parts from molds like these would have been either too slow for economical production or completely impossible with other plastics. High density polyethylene, however, solidifies in the mold at a high temperature yet remains flexible for stripping at fast cycles. Production efficiency was increased by using beryllium copper in many cavities and cores for effective heat removal.

Interested? If you have a job for high density polyethylene count on Grace for help. Now's the time to contact:

Technical Service Department,
W. R. Grace & Co., Clifton, N. J.

(CONTINUED FROM PAGE 26)

the hundreds of pieces of equipment on display by over 40 major firms.

Friden, Inc showed its Collectadata line that offers a system of code-reading and code-punching units to collect data at a central processing point from various points of origin. Collectadata, Friden says, is engineered for internal systems whereby information must be channeled to, and accumulated at, one location from many widely separated sources. And, it is hard to find a place in industry where the system couldn't be put to valuable use, Friden says.

National Cash Register Co was pushing its sales-tronic system—a 3-unit combination of machines located at the point of sale that relieves sales clerks of most mental calculations.

Burroughs Corp. unveiled a newly developed solid-state electronic computer data processing system—the first, Burroughs says, capable of reading and writing the same language as the human eye can read.

Specifically designed for the banking industry, Ray R. Eppert, Burroughs' president predicted a big market for the system. In fact, since the equipment was first shown some 10 days before the Washington exhibit, Eppert said the company had tallied over $7.5-million production orders. He thinks the ice hasn't yet been broken not only in the banking industry but in other industries.

Other companies such as Eastman Kodak, Remington-Rand, Pitney-Bowes, Victor Adding Machine, IBM, Mosler Safe, Comptometer Corp, etc all had their latest wares on display. It was one of the largest, most elaborate exhibits of its kind that most observers could recall. ■

Missile Firm Shops for Retired Engineers

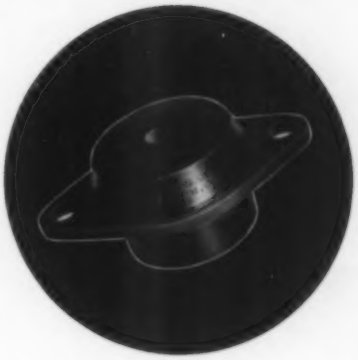
WYANDANCH, L. I.—An effort to tap a large pool of highly qualified but unemployed engineers has been set in motion by Astronics Div of Fairchild Aircraft here in Long Island. In recent weeks, Fairchild has placed classified advertising in the New York *Times* and *Wall Street Journal* employment columns for "Retired Technical Talent Only."

Faced with a chronic need for more

(CONTINUED ON PAGE 32)

MB

vibration isolators



stand up in severe service

This Isomode® Type 5 mount is successfully isolating engine of Allis-Chalmers HD-6 Crawler Tractor. It survives severe shocks, rough motions, distortions, bursts of power and high engine torque inherent in operation of tractor dozers.

With a core in balanced compression and shear, the compact mounts have high load capacity, and are self-snubbing against shocks. Having equal spring rate in all directions, the mounts equally isolate the 6 possible modes of vibratory motion.

MB concentrates on standard mounts which are actually in the special performance class. If you have a problem, avail yourself of our 20 years of experience. Send for Bulletin 616A.

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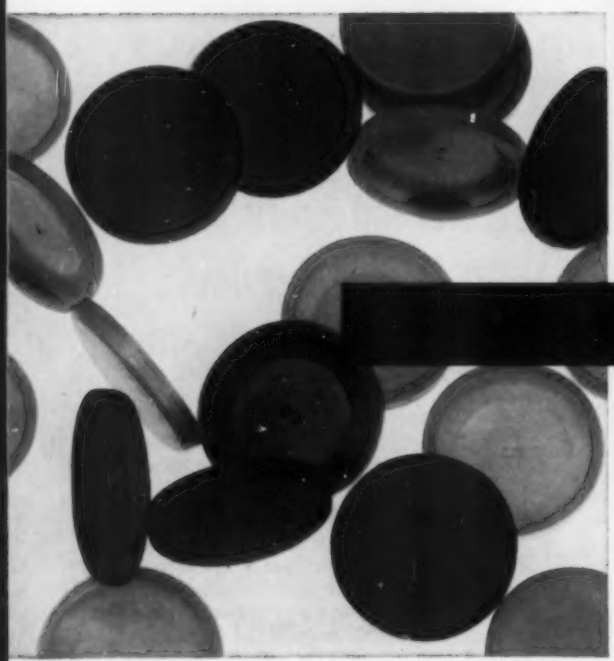
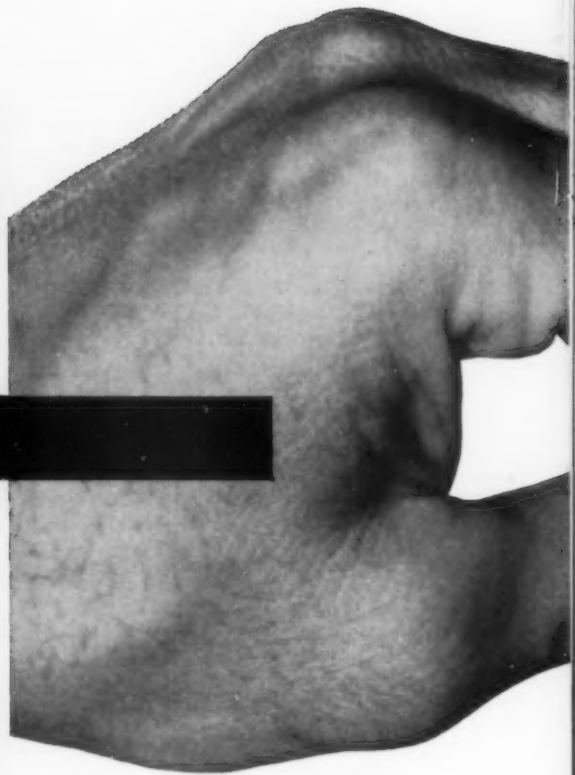
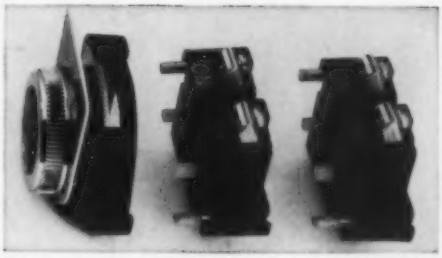


YELLOW BLUE GREEN GRAY BROWN BLACK

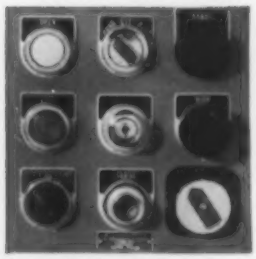


WESTINGHOUSE FLUSH PUSHBUTTON

puts the finger on color coding with snap-on color caps !



Shallow contact blocks stack for multiple control circuits. Angled terminals are easy to get at with a screwdriver, even when blocks are stacked.



Available in a full range of operator designs.

HERE'S PRACTICAL PUSHBUTTON COLOR CODING—the economical Westinghouse way. Snap-on color caps let you change colors *without changing buttons.* Simply remove the clamp ring and color caps snap off easily and can be replaced in a matter of seconds.

Simplified color coding is but one of the many pluses for new Westinghouse flush pushbuttons. Thin operator and shallow contact blocks make this pushbutton *thinnest overall.* Contact blocks stack for control of multiple operations, another space-saving feature.

Flush pushbuttons are oiltite, of course. And they meet exacting machine tool and control panel requirements. Available in a full range of operator designs.

Regardless of your pushbutton requirements, order with confidence from industry's most extensive line. Contact your nearby Westinghouse sales office or distributor, or write: Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa.

J-30304

YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV FRIDAYS

CIRCLE 31 ON READER SERVICE CARD

(CONTINUED FROM PAGE 29)

engineers, Richard Gulliver, industrial relations mgr, conceived the idea of turning to the older-age group for professional assistance. Engineers who qualify can work out their own time-schedule with Fairchild. The company will accept candidates full-time, if the engineer so desires, or on a part-time basis. Gulliver expects that many will work as internal consultants or in some sort of advisory capacity.

These ads, which their Fairchild authors believe are something unique in engineer hiring practice, have drawn a large number of resumes from retired engineers. No one has been hired yet, but Gulliver says that he has a heavy schedule of interviews ahead.

Gulliver has great expectations for the success of this program. The retired man who wants to go back to work is a "really dedicated type," he says. And the older man is apt to work steadily and consistently where the young fellow often alternates great bursts of activity with lengthy coffee breaks. Gulliver expects harmonious relations between older newcomers and the regular engineering staff. Engineers he says, recognize the seriousness of the manpower shortage and know that the retired man may be older in years but not in his thinking.

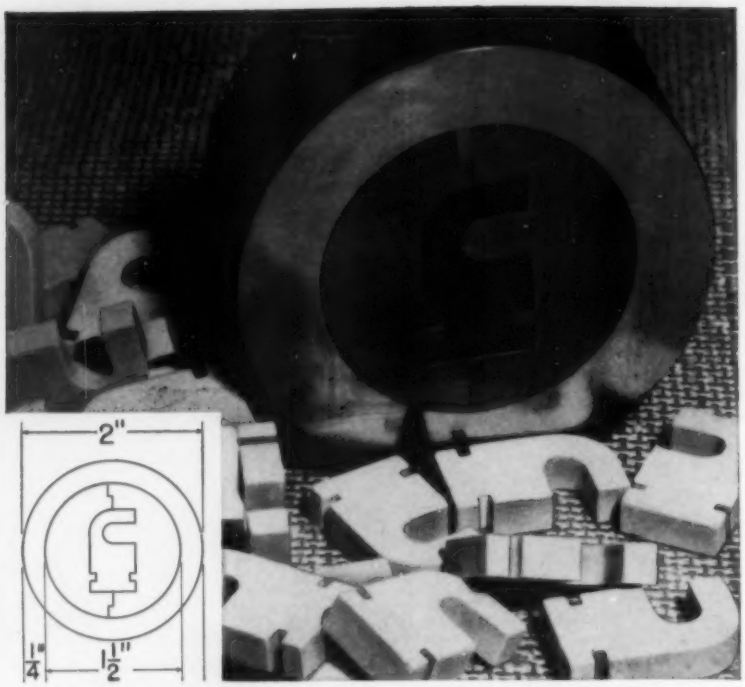
Fairchild has a compulsory retirement system but, at present, few of its engineers are approaching retirement age. Hence, the company's own staff does not presently offer much opportunity for recycling back to the lab.

The company is making its initial appeal through newspapers that have broad circulation. The engineer who reads the *Wall Street Journal*, Gulliver says, is apt to have financial status and "be the sort of responsible man we are after." ■

Technical Schools Boast Higher Enrollments

NEW YORK — Unlike engineering schools throughout the US, technical institutes managed to increase enrollments in 1958. This upward trend is affirmed by two recent surveys—one by the Engineering Manpower Commission, the other by Donald C. Metz of the American Society for Engineering Education.

The Manpower Commission study shows that 26 institutes able to give



Section of die used for making a ceramic component for the electrical appliance industry. One half of the dark center portion subjected to wear is made from Kennametal grade K96 . . . the other half from an "equivalent" competitive carbide.

By accident . . . this company found

There is a difference in CARBIDES

An accident that broke one section of this die gave Du-Co Ceramics Company, Saxonburg, Pa., an excellent opportunity to compare carbides. The original die was made from Kennametal grade K96 and had turned out 800,000 steatite hooks before the accident. In replacing the broken section, an "equivalent" competitive carbide was selected.

After an additional run of 200,000 hooks, the original K96 section of the die still showed no sign of undercutting from abrasion. A dull finish was the only evidence of wear . . . after 1,000,000 pieces.

The newer section, however, showed definite undercutting after 200,000 and Du-Co estimates a total of 500,000 will be its maximum life.

Chances are an answer to *your* wear or corrosion problems can be found within the wide range of Kennametal compositions. Hammers for grinding and pulverizing machines, rolls for cold rolling other metals, gripping devices that bite into the hardest steel, pump seals for highly corrosive acids, valve parts that resist attacks by acid and abrasive slurries . . . these are but a few of the many successful applications of Kennametal compositions.

And further advances are still being made. Recently developed Grades K601 and K701, for example, offer new economies in resistance to corrosion. For applications requiring strength at extremely high temperatures (to 2200°F), the Kentanium* series of hard titanium carbide alloys is unmatched.

For more details contact your Kennametal Representative or write KENNAMETAL INC., Department PE, Latrobe, Pennsylvania. 97236

*Trademark

INDUSTRY AND KENNAMETAL ...Partners in Progress

historical data enrolled 10,256 students in 1958 compared with 10,137 a year earlier. The Commission notes, however, that this 1.2% gain was slender in comparison with a 10.2% of 1957 over 1956 enrollments.

Nearly half of the institutes in the survey expect a greater number of students this fall. Despite stiffer entrance requirements set by many schools, only ¼ report a decrease in the number of qualified candidates. Stiffer requirements are expected to increase the number and quality of students completing course work.

The ASEE survey of 207 schools showed 1958-59 enrollments of 78,539 against 1957-58 enrollments of 73,351. These figures include both full-time and part-time students. For schools with at least one curriculum approved by the Engineers Council for Professional Development, the same pattern emerges. These schools reported 6814 students last year and 5641 the year before. ■

NSF Subsidizes New Lab Equipment

WASHINGTON—Dissatisfied with standard catalog offerings of science teaching equipment, the National Science Foundation has underwritten a $189,000 program to get something better. So far, the Foundation has awarded 18 grants to university scientists, engineers and mathematicians to develop apparatus for both highschool and college labs.

Once equipment is developed, the grantees are expected to allow interested commercial suppliers to enter negotiations for producing and marketing. Proposed apparatus runs the gamut from engineering to psychology.

Here are a few of the grants: Henry M. Neely, Department of Mechanical Engineering at Kansas State, is working on transparent overlay aids that can be used with an overhead projector to illustrate fundamental concepts of engineering graphics. Nelson L. Walbridge, Univ of Vermont, is developing modified research apparatus for quantitative experiments on properties of waves. This equipment is for advanced courses in mechanics and physics. And R. K. Moore, Univ of New Mexico, is making an inexpensive kit-style digital computer that can be assembled and used by highschool and college teachers and students. ■

Women love APPLIANCES with the new no-Knot. Coiled Cord!

No-Knot Appliance Coiled Cords are winning "popularity contests" with women everywhere! Safer, neater, self-storing—everything's *new* about no-Knot Cords. A convenience proven on a million phones . . . now ready to give your appliances the same extra mass-appeal. No need to redesign your products—add no-Knot Cords anytime.

Now available in HPN, Type SP and Types SV, SJ . . . covering full appliance range.

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For FREE Sample clip this coupon, attach to your letterhead, sign your name and mail to:

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CIRCLE 79 ON READER SERVICE CARD

MICROBEADS

a new Insulating Material

Microbeads are microscopic glass beads available in a wide range of mesh sizes. They are highly resistant to the passage of heat and are virtually unaffected by moisture. In addition to these characteristics, Microbeads possess a fascinating array of physical and chemical properties that make them an ideal insulating material. Once you've seen them . . . worked with them . . . you'll discover they have a vast potential for other applications as well. Microbeads could be the answer to your particular problem. Free samples and technical data are yours for the asking.

M3A

MICROBEADS, Inc.
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Microscopic Glass Beads for Industrial and Reflective Purposes

CIRCLE 80 ON READER SERVICE CARD

A HANDFUL OF POWER

DOWTY Pressure Balanced HYDRAULIC GEAR PUMPS

Pressures to 2500 PSI • Outputs from 1/2-60 GPM

Shown here is our Model GP2-85 which will deliver 18 GPM at pressures to 2000 PSI. Volumetric efficiency exceeds 95% throughout the operating range. Fully pressurized lubrication independent of discharge pressure. 14 other sizes available.

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A Division of Oliver Tyrone Corp.

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CIRCLE 33 ON READER SERVICE CARD

How NS solved another special steel problem

LENS GRINDING—the intermediate grinding stage, called "fining" is done on this type machine. The square piece of optical glass, with corners trimmed away, is mounted on an overhead chuck which bears down on the fining tool. The fining tool surface is covered with a round piece of wire cloth (man's finger is touching edge of wire cloth) which carries the emulsified emery abrasive used in grinding the lens.

WIRE CLOTH disk is laid over tool surface and pressed down. Pressure-sensitive backing holds wire cloth to tool surface during grinding operation.

NS-REYNOLDS WIRE CLOTH CUTS ERRORS FOR LENS MANUFACTURER

A leading manufacturer of ophthalmic and corrective eye glass lenses has eliminated tool wear, reduced lens grinding error and cut production time with a new integrated surfacing system for grinding tools, utilizing National-Standard Reynolds wire cloth as an abrasive carrier on the tool surface.

NS SOLVES A PROBLEM—Before the addition of the wire cloth tool facing, it was necessary to regrind the lens fining tools after every 3 or 4 lenses—a time consuming, costly procedure. The lens manufacturer came to the Reynolds Wire Division of National-Standard for help in finding a wire cloth with the high-degree of uniformity necessary to serve as a facing for the grinding tools. Reynolds Wire engineers recommended 0.007-inch, electrogalvanized steel wire woven to 30x30 mesh. Wire diameter was held to within a 0.00015-inch tolerance.

Under testing by the lens manufacturer, it was found that the wire cloth's uniformity allowed precision in grinding that virtually eliminated re-working. Grinding tools no longer needed re-truing, human error in finishing was eliminated, and the wire cloth held the grinding abrasive uniformly across the tool face for greater accuracy.

EXPERIENCED ENGINEERING HELP of this kind, for jobs requiring specialty steel and wire is available to you from National-Standard. For the many thousands of applications where only specialty steel or wire will solve the problem, let National-Standard engineers go to work for you. Write for additional information to National-Standard Company, Niles, Michigan.

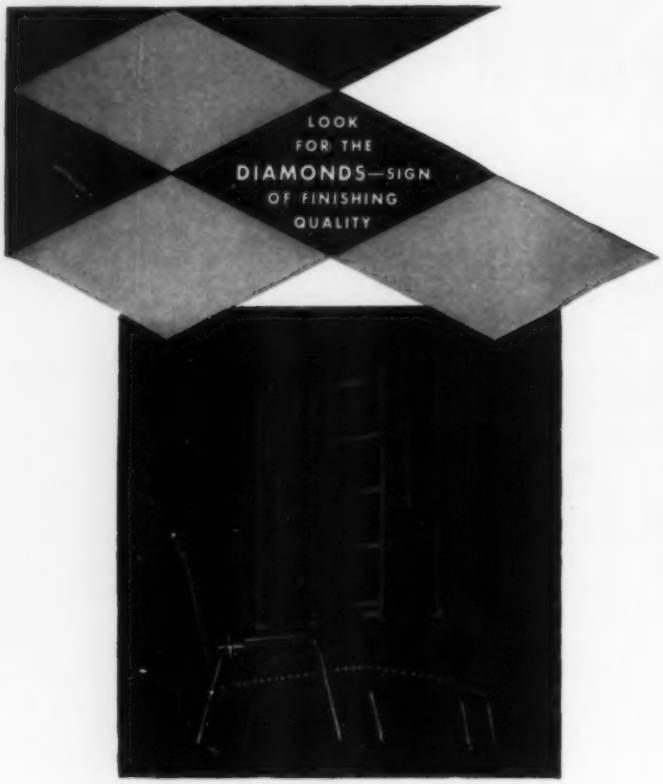
Manufacturer of Specialty Wire and Metal Products

NATIONAL NS STANDARD

DIVISIONS: NATIONAL-STANDARD, Niles, Mich.; tire wire, stainless, music spring and plated wires • **WORCESTER WIRE WORKS** Worcester, Mass.; high and low carbon specialty wires • **WAGNER LITHO MACHINERY**, Secaucus, N. J.; metal decorating equipment • **ATHENIA STEEL**, Clifton, N. J.; flat, high-carbon spring steels • **REYNOLDS WIRE**, Dixon, Ill.; industrial wire cloth • **GROSS PERFORATED METALS**, Carbondale, Pa.; decorative, commercial, and industrial perforated metals.

GRINDING TOOL with wire cloth layer is inserted into bottom chuck of fining machine. Chuck rotates the tool for about 8 minutes during fining operation.

LENSES go through fining operation in one of four machines shown in the foreground before being polished in machines at the rear. The addition of wire cloth has also cut the fining operation time.



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ON ALUMINUM

An IRIDITE-IRILAC finish will provide longer life for storm doors, windows, outdoor furniture, auto parts and accessories, tubing or wire goods. And, you have a choice of color finishes such as natural aluminum and golden yellow. Other colors may be obtained by an additional dye operation.

ON MAGNESIUM

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ON ZINC

IRIDITE plus IRILAC gives your product longer life and brighter appearance. Color choices range from clear IRIDITE to olive drab, plus colored dye finishes.

IRIDITE is the tradename for a specialized line of chromate conversion coatings that can be applied to any non-ferrous metal by brush, dip or spray methods—at room temperatures—manually or with automatic equipment. Upon application, a thin film forms which becomes an integral part of the metal itself, and thus cannot chip, flake or peel. No special equipment, exhaust systems or specially trained personnel are required.

IRILAC is the tradename for a line of clear protective coatings for all metals. As safe and easy to handle as water, they may be applied by brush, dip or spray methods. No exhaust or special fire protection equipment required. Adds protection and abrasion resistance to any base metal, plated part or parts treated with electrolytic or chemical post treatments, without chemical change.

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Soviet engineers

The Soviet Exhibition brought them to New York. Intense curiosity brought them to our conference room to exchange questions and ideas with Product Engineering editors.

Technical books—in any language
Here Russian engineers examine McGraw-Hill books in the private dining room. From left: Valentin Levshunov, chief of the machine-tool section of the exhibition and machine-tool designer since 1935; Alexander Lededev (obscured), electronic engineer on machine tools; Ivan Rodichev, deputy director of the exhibition; E. J. Tangerman, editor of PE; Valerii Solovov, machine-tool designer since 1948; Yulii Evstegneev, research engineer on machine tools since 1941; and Yurii Akimov, electronic engineer.

■ What questions would you ask your Russian opposite numbers, given the opportunity? We had the chance to meet them on our own ground recently. Soviet engineers, on hand for the USSR Exhibition, were as curious to meet and talk with us as we were about them.

They were squired by Ivan Rodichev, deputy director of the exhibition, who spoke excellent English, as did four of the five engineers. To avoid misunderstanding, we had two interpretors, theirs (a lovely young lady named Eugenia), and ours (Alex Tatistcheff, head of McGraw-Hill's Translation Dept).

What were their reactions to Americans at the Exhibition? Surprise at our interest in the personal and social aspects of their lives and our relative disinterest in technical details. They had come fully prepared for every technical question they could think of—were asked, instead, what they ate, how their television compared to ours, where the pictures of Stalin were.

And so we served up this grab-bag of technical and organizational questions. Their response wasn't nearly as specific as it might have been. Perhaps some of the questions were too pointed, and some were hard for them to understand because their entire way of life is different. At any rate, here are the answers:

Q What arrangements do you have for determining which products to design?

A There are three types of design organizations in the industry of the USSR: design bureaus of manufacturing plants; design bureaus servicing several plants and subordinated to the Council of National Economy of a specific economic district; and the scientific research institutes.

In the machine-tool industry, for example, plant design bureaus make improvements in the machine tools being manufactured by the plant, create various modifications based on machines being manufactured, and design

Joining the Order of the Sliderule
Eugenia Dakutina, interpreter, clips a miniature sliderule tie holder on Ivan Rodichev, as Valentin Levshunov and Yurii Akimov wait in line. This kind of gadgetry is still unavailable in the USSR. Most of the clothes you see are prompt American purchases. Mrs. Dakutina is married to a chemical engineer, has an excellent command of technical English. Her husband's salary, because he is the nominal family head, determines their rent range, hence their apartment. On the other hand, Akimov's wife is listed as family head, so her income sets housing level. Levshunov is an extremely competent engineer and executive, speaks almost no English; the others range from fair to excellent in conversation.

new machines. If the plant bureau has not sufficient time for design because of overloads, the job is transferred to a design bureau of the second type. The design bureau serving a group of plants specializes in a certain product (automatic lines, for example) and designs new products in accordance with technical specifications given.

Scientific research institutes (ENIMS in this case) study existing machine tools, develop solutions to scientific-technical problems and design more advanced machine tools. The communication between plants, bureaus and institutes is direct, following plans approved by the Council of National Economy of the district or by the State Planning Commission.

Q Are committees used in solving final problems of engineering design?

A When new machines are designed, technical specifications are discussed by the scientific and technical councils of the bureau or the institute. Various specialists are invited, including representatives of the plant consumer [customer], to take part. When the object to be designed is very complicated, specialists in different fields are also invited.

Q Do you feel that specialization is good? Or, if you are a specialist yourself, would you welcome a chance to work in a different branch of engineering?

A In the USSR, there are both the specialists of very broad profile working on complex problems, and those, called "narrow" specialists, working on specific problems but in fuller detail. Both types are required by industry.

Q How standardized is the choice of competing production processes for a given part? For example, if you have to make a crankshaft, can you specify either a forged or cast crankshaft or are there standard processes for standard products?

A Manufacturers have technological departments which develop processes for parts, considering available equipment and the possibility of cooperation. These departments are guided by instructions developed by the ENIMS.

Q Is there any coordination between engineering design and appearance design?

A In order to make new designs expedient, the educational program of an engineer includes technical art drawing. In addition, the staffs of many bureaus include specialist-artists who, together with designers, create the most expedient shapes.

Q What can the purchaser do if he is not satisfied with functioning of equipment?

A He can demand improvements of the design at the expense of the designing organization. When a new machine is designed, a special commission including a representative of the plant consumer decides on suitability.

Q How much choice does the buyer have in selecting type of control system?

A The consumer specifies all necessary properties in the technical specifications. The new design or modification is carried out accordingly.

Q How long will you let R & D projects go without tangible results?

A Research projects can last very long (several "tens" of years) if the subject has future. This is true even if no good results can soon be expected, and even if present results are negative.

Q Would the Soviets participate in a conference on international standards?

A USSR is a member of the International Association of Standards (ISO) and takes part in the work of the majority of its committees.

Q What is the "Express Information Service" and how does it function?

A The "Express Information Service" is an institute at the Academy of Sciences which studies periodical litera-

THE ENGINEER IN THE USSR

His Job.

Most work a 45-hr week (8-hr day, 5 hr on Saturday); some work 40 hr. They expect the 40-hr week to become standard soon.

Incomes are from salary, plus overtime; plus yearly bonus, plus cash-award system—all calculated to reward the more-productive and outstanding individuals or group.

As for salary increases, an engineer may have to ask his superior for a raise in order to get one. If he is not satisfied, he may look around for another job (he can change jobs without permission). But there are no want ads or independent employment agencies, so job-seeking depends on personal contacts. A soviet engineer wouldn't dream of asking a strange plant superintendent for a job.

Thus, few of the engineers we talked to have ever changed jobs. The attitude is that ability will be recognized. Also, salary depends on experience, and changing from one industry to another means lost time. Further, close friendships are made at the plant. Many plants have movies, dances, recreation halls. Evening chess and card parties are common; so engineers hate to move on.

All our guests are members of their respective trade unions which include all the employes of the particular industry—engineers, shop, and office personnel. Each plant has its own "local" union which elects a committee representing the plant at the area's or city's union of that industry (Moscow Union of Machine Tool Workers). Above all is the All-Union Council of Trade Unions, covering every industry or profession.

About half the engineers we met also belong to a scientific or technical society—which holds meetings and issues technical periodicals. On a local level, the plant's newspaper may allocate one page for scientific-society news. Organization levels are similar to the trade unions'.

His Home.

Although all the engineers we talked to lived in Moscow, in apartments near the place of work, some owned "cottages" in the suburbs. Here, they spend week-ends and summer vacations. Their families, of course, can stay for longer periods. Although the cottages may be only an hour or so away, commuting is out of the question because of the severe winters which tie up transportation.

Rent for an apartment is based on a percentage of income. Cottages can be purchased outright. Usual procedure, however, is to apply for a parcel of land directly through the plant (there is a special "building agency" in each plant). The plot is given free of charge—although technically the state retains its rights to the land. Sizes of plot vary—but if one takes a large plot, he must "fulfill the minimum," which is to plant and grow a specific number of fruit trees and other food crops.

The engineer either builds the house himself, with material he purchases, or he pays a construction agency to build it for him. (The state owns all means of production; labor cannot be exploited for private profit). One engineer said cash awards for outstanding design work paid for his cottage, but he could have borrowed money at low interest rates for building purposes. He can sell or bequeath this house and property (he can accumulate property and money) but will not be given a free building plot again.

The planning concept seems to have become part of the Russian's normal way of looking at things. Every plant, every store is planned and controlled by the government. Schooling, medical expenses and unemployment benefits are free. Thus, while awed by the variety of stores in the US, especially in the suburban shopping centers, the Russians were made uneasy by the haphazard way each venture seemed to have been established. They did not like the thought that anyone may open a new store almost anywhere, with a minimum of red tape. Each store, they feel, should be carefully placed in a specific area depending on the needs of the locality. Each worker should get approximately the same pay regardless of the amount of business. —NC

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ture and, in a very short time, publishes for wide circulation abstracts of all papers presenting subjects of scientific and technical interest.

Q Which precision-casting processes are used most widely in the USSR?

A In the machine-tool industry, the following types of casting are used: casting in chill molds, pressure die casting, investment casting, shellmold and centrifugal casting.

Q How extensively are computers being used in the Soviet Union? For what purposes? Industrial control, Engineering problems?

A Various types of computing machines are widely used, especially for technical and scientific problems.

Q If an engineer is dissatisfied with his job, how does he change it?

A He can accept an employment offer of another organization or ask a supervising organization to transfer him to another organization.

Q Are helical gears being rolled? Can rolled spur gears be used in machine tools or are they restricted, because of lack of precision?

A In the USSR, gear rolling is used for manufacturing gears with straight and spiral teeth. These have not yet found wide use in the machine-tool industry because gears of higher precision are required there.

Russian Questions

Toward the end of the meeting, the Russians turned the tables and presented their own list of questions. They dealt almost exclusively with machine-tool design. Here are samples:

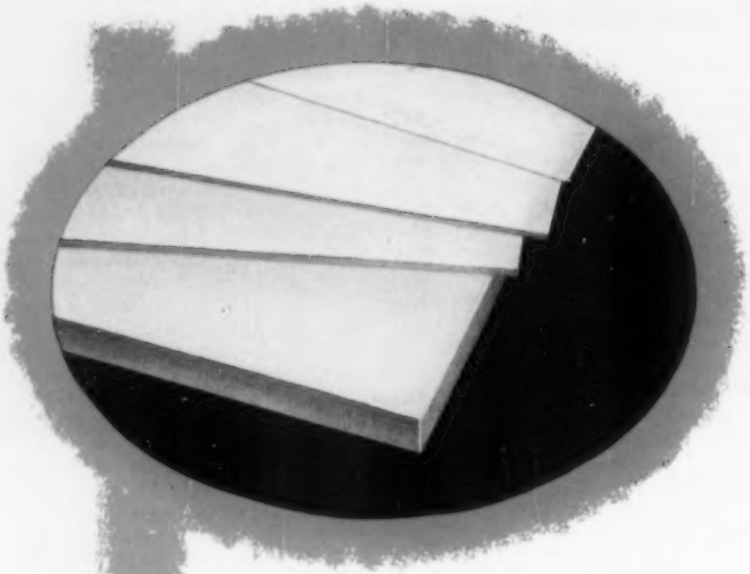
How widely are digital program machine tools used in this country? An answer in statistical terms would be preferred.

What are the prospects of digital control of lathes? What will be the percentage of digital controlled machine tools, say, in 5 years?

Are universal or special computers used in preparation of programs for program machines? What factors determine this selection?

Are rough parts moved or are they fixed while being processed on automatic lines?

How widely are automatic lines of metal-cutting lathes



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Processing can radically change Teflon properties

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Soviet Engineers (CONTINUED)

used in this country? How great is the production of such lines?

Should the design of modern machine tools plan for the possibility of equipping them with loading attachments?

Is high-speed gear cutting (speed 100-200 mm per min) with feeds greater than 2.5 mm being used.

Are there stepless drives with a side V-belt? What are their power and revolution ranges? How is it possible to eliminate vibrocorrosion in these drives? Do they make such belts of nylon?

Are there drives for stepless changing of angular velocity during one revolution? (for machining the profile of a turbine blade).

What is the trend in further development of electroerosion machining?

Is there any trend for developing anode mechanical machining of metals? Is there proper equipment for that purpose?

How do you improve ultrasonic equipment? What is the trend of its development? What is the maximum power used on ultrasonic machine tools and what is their productivity?

How accurate are measuring instruments? What minimum error can be measured with their help? In what way are they used and developed in the automatization of equipment?

Could we receive catalogs on modern equipment?

Russian Visits

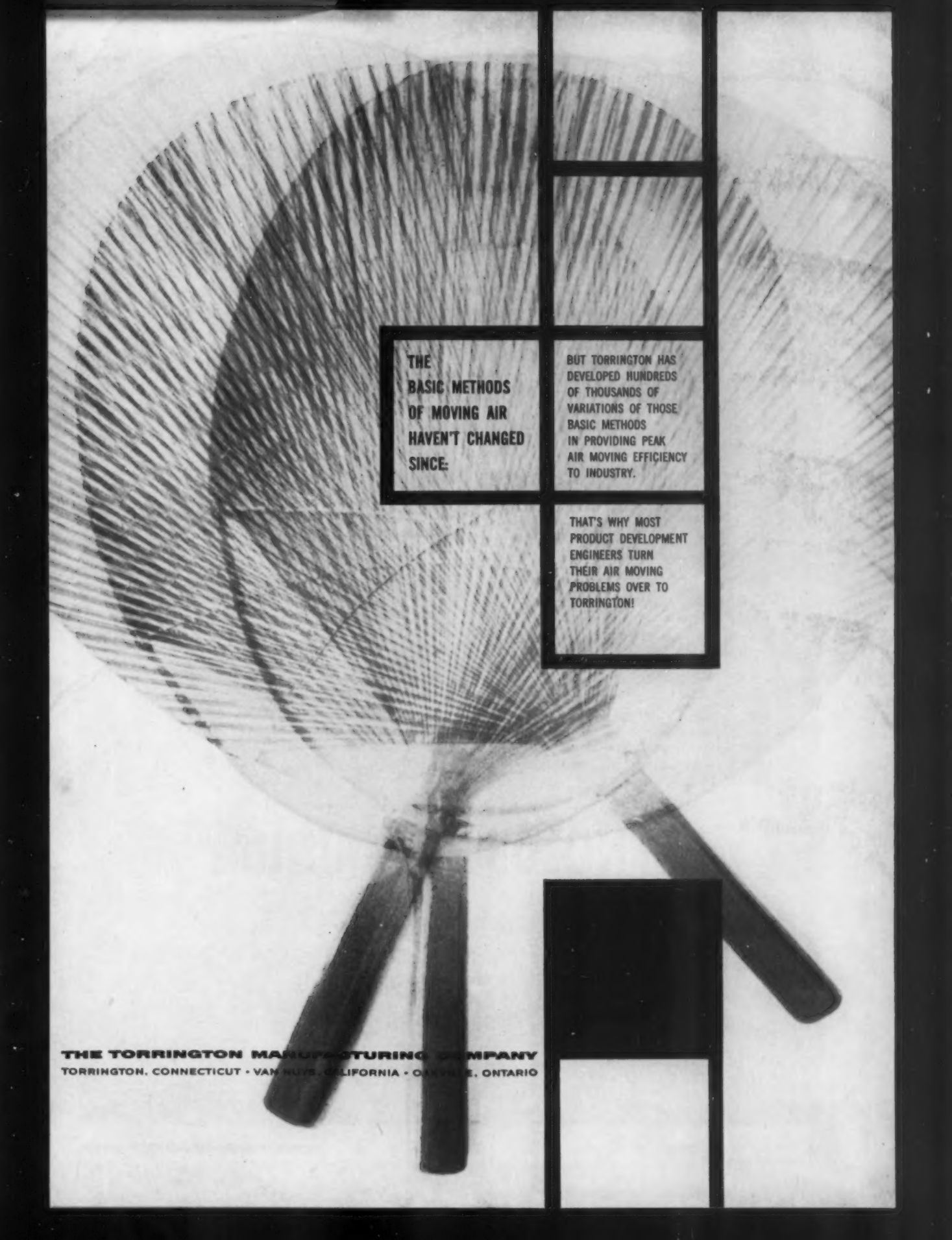
The Russians asked us to arrange a visit to a machine-tool plant. Editor Tangerman tried hard, but planned reciprocal visits, government contract work and 25-mile travel restrictions made such a tour impossible within the time available.

Another request—to visit Americans in their homes—was easily arranged. Associate Editor Yeaple escorted them out to his New Jersey home. A motor-driven lawnmower turned out to be the major attraction.

We also met for lunch around town several times afterwards. By tacit agreement we avoided discussions on foreign affairs, political personalities and the likes, but that didn't stop many friendly, round-table discussions on their—and our—basic way of life. Some of the things we learned appear in a separate box. ■

CIRCLE 40 ON READER SERVICE CARD

CIRCLE 41 ON READER SERVICE CARD→


THE BASIC METHODS OF MOVING AIR HAVEN'T CHANGED SINCE:
BUT TORRINGTON HAS DEVELOPED HUNDREDS OF THOUSANDS OF VARIATIONS OF THOSE BASIC METHODS IN PROVIDING PEAK AIR MOVING EFFICIENCY TO INDUSTRY.
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How Aluminum gives you more ways to improve products, lower costs . . .

The "idea" sketches on the opposite page show just a few of the ways aluminum can improve the design and reduce the cost of appliances. And you can multiply these ideas by the hundreds, when you start thinking in terms of aluminum for other products, as well. Here's how you improve—and save—with aluminum:

1 You can make a part or product *better* with aluminum. You can make it lighter, usually with no sacrifice in strength. And aluminum is rust-free and corrosion-resistant, which means longer product life, better appearance and less maintenance.

2 You can *produce* a part or product so many different ways in aluminum. You can cast, stamp, machine punch, pierce, perforate, roll-form, or expand it.

3 You can *join* aluminum parts in so many different ways. Aluminum welds easily and quickly, fastens with mechanical fasteners, bolts and rivets, tabs and cast pegs, metal stitching and epoxy resin adhesives.

4 You can *finish* aluminum in so many different ways. Often, aluminum needs little or no finishing at all . . . or you can use pre-enameled Reynolds Aluminum Colorweld Coil, or One-Side Bright Aluminum to eliminate finish operations, widen design possibilities. Embossed or brush finishes, aluminum laminates, and color anodized aluminum sheet add still more design opportunities.

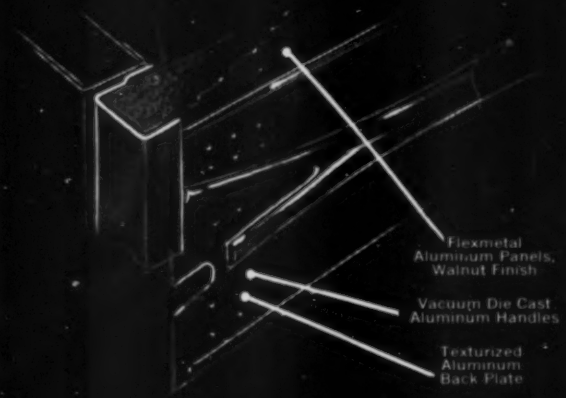
5 You can *lower costs* so many different ways with aluminum. Lightweight aluminum saves shipping and handling costs . . . an aluminum extrusion can often eliminate certain operations and provide a better product . . . aluminum machines and forms easier, faster . . . finishing costs are often cut . . . and production techniques possible only with aluminum can lower final costs in dozens of other ways.

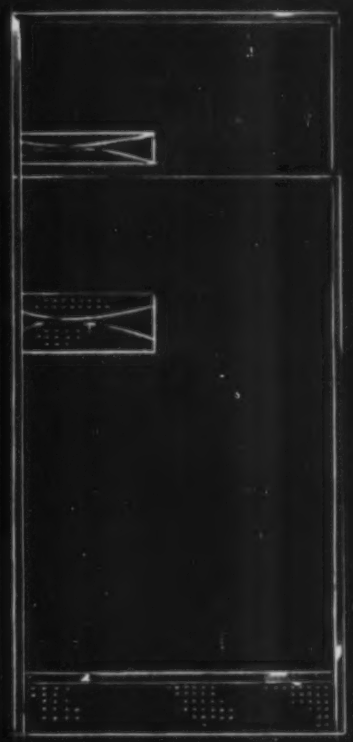
Learn about *all* the ways aluminum can help improve a product or lower costs . . . For technical data and information on the properties, availabilities, and possibilities of aluminum, call your local Reynolds office, or write *Reynolds Metals Company, P.O. Box 2346-HN, Richmond 18, Virginia.*

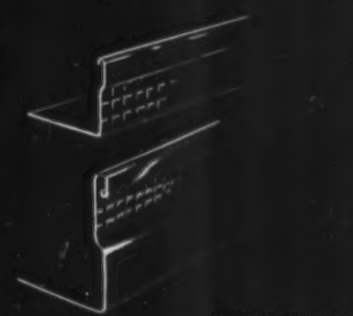
Watch Reynolds TV shows—"ALL STAR GOLF" and "ADVENTURES IN PARADISE"—ABC-TV

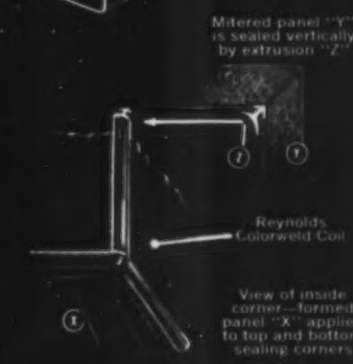
REYNOLDS ALUMINUM

...in refrigerator design, for instance



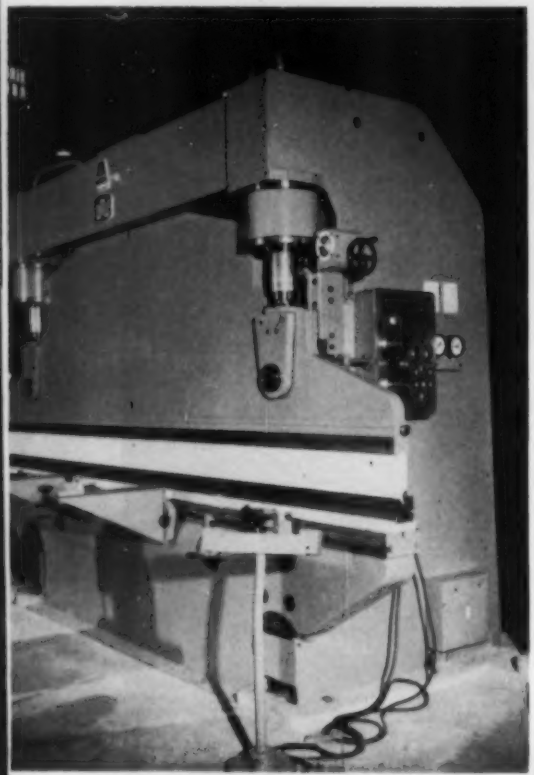




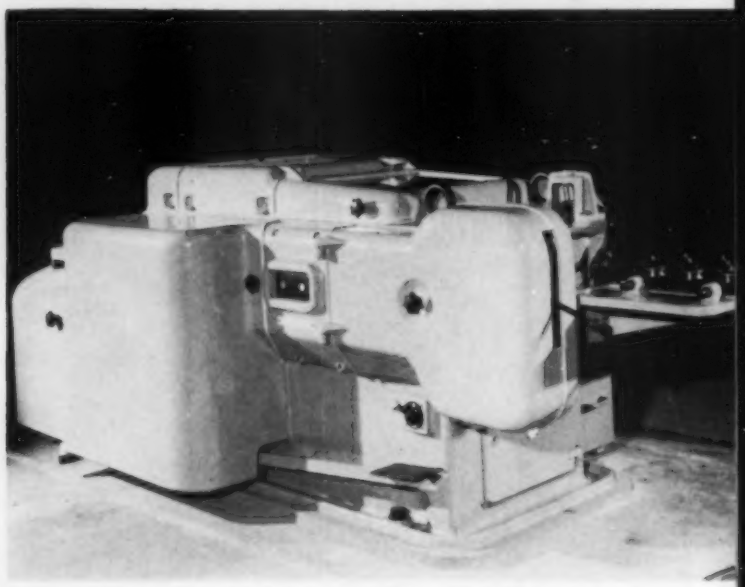

Mitered panel "Y" is sealed vertically by extrusion "Z"
Reynolds Colorweld Coil
View of inside corner—formed panel "X" applied to top and bottom sealing corners

CIRCLE 43 ON READER SERVICE CARD

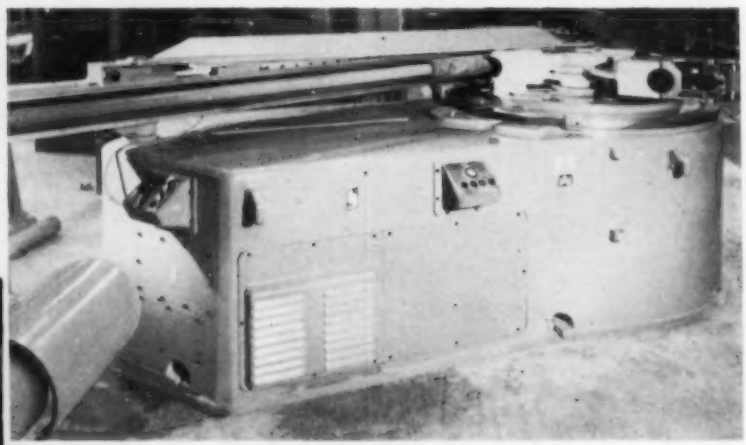
TRENDS IN APPEARANCE DESIGN . .



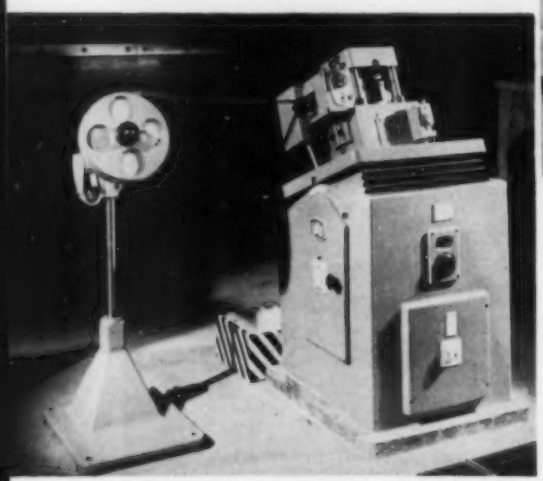
Clean lines of this all-welded hydraulic press-brake result from containing all hydraulic equipment within the upper crossrail between end frames, and integrating yoke assemblies into over-all machine. Max workpiece width is 167 in.; max clearance between ram and bed, 17¾ in.; stroke rate at 3⅛ in. ram movement, 30 per min.



Horizontal press makes balls (9/16-in. max dia) or rollers (¾-in. max dia) for bearing applications from rod or wire at a max stroke rate of 160 per min. Accessibility is good, through easily removable or swing-away housings, but control placement and over-all integration could be better.



Pipe-bending machine has integrated, ground-hugging housing, with controls grouped into two finger-tip-height consoles.



Automatic-feed punch press rated at 2½ tons gains look of stability and cleanliness from emphasis on cubical shapes, which matches unusual wide-geared device used for adjusting tilt angle of die bed.

EAST GERMANY

Heavy, cheerless, unimaginative stand the rows of new houses and public buildings in East Berlin, Leipzig and Dresden, the principal cities of the German Democratic Republic (East Germany). Domestic automobiles look out of date without belonging to any particular era. Appliances, radio and TV sets on display in shop windows are throwbacks to similar US products of the thirties.

But things are changing fast. A campaign to introduce better design is well underway, and one of the important starting points was such product details as knobs, dials, handles and attachments.

These have been designed and standardized. They provided a dramatic demonstration of industrial design's capacity to save money, materials and production time while turning out a better product. Another early example was the country's largest producer of ornamentation for furniture, such as drawer and door pulls. After redesign, exports increased 2000%.

Professor Horst Michel, the Institute for Interior [industrial–Ed] Design at the Weimar University of Architecture & Building (of which he is director), and the new design center in East Berlin, have been the leaders and major forces behind the efforts to emphasize good taste and simplification in product design. "When only the good is produced, the bad can no longer be sold," says Professor Michel, as he explains that although acceptance of design proposals from the Weimar and East Berlin centers is not compulsory, there is more and more acceptance of these services.

"As a result," Michel continued, "the 'avant garde' may be ahead in West Germany, but the German Democratic Republic leads in the mass production of products that have been through the redesign process. Our average is better, also. While our start was slow, we're building up. Also, our manufacturers can't use the excuse that customer demand is for such-and-such a product–there is still considerable unsatisfied consumer demand."

As would be expected in an economy that favors heavy industry, machine tools and other heavy machinery provide a number of examples of good design. Laboratory equipment and instruments are often clean-lined and functional.

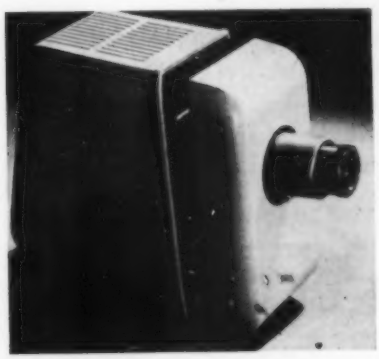
At a major exhibition of its work in West Germany in 1957, the designs displayed by the Institute received generally favorable reactions. Since that time, Professor Michel has travelled widely in Western Europe, speaking at international gatherings of industrial designers.

However, isolation is still a problem for East German designers. They have even less ordinary contact with Westerners–except on such special occasions as the Leipzig Fair–than Czechs, Poles and Soviet citizens. And the burdensome hand of bureaucracy is still heavily evident in more than one field.

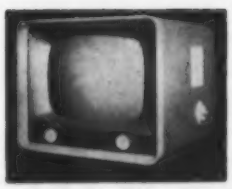
But perhaps East Germany's impending membership in the exclusive club of nations having commercial jet-transport service will hasten the broadening of communications. True, their first prototype crashed at Leipzig this spring, but, then, England had considerable trouble, too, with the early Comets and has come back to win the Sperry award this year. –MH

Plastic body "Trabant" has 18-hp, two-cyl engine, typical European small-car look.

Sedan version of attractively simple "Wartburg" pickup truck right, (37 hp) was shown at New York's International Auto Show last Spring, heavily bedaubed with chrome.



Designed by an industrial design student and now in production at a state-owned firm in Dresden, film-slide projector's housing closes into clean-lined whole.



East Berlin students designed this TV set, now in production, eliminating dated look.

Manufacturer: Industrial Television, Inc., Clifton, New Jersey • Molder: Shasta Mfg. Company, Berkeley Heights, New Jersey

Tough body for a big voice

This portable, battery-powered megaphone has a tough, strong bell made of SUPER DYLAN® high-density polyethylene —a plastic product of Koppers.

With its smooth, glossy, bright red SUPER DYLAN bell, the megaphone can take plenty of punishment. Moreover, SUPER DYLAN is dimensionally stable, lightweight, rust-proof and chemically inert. No painting. No chipping. No flaking.

So, if you need a tough, strong and colorful plastic material, be sure to consider SUPER DYLAN polyethylene. For further information on SUPER DYLAN, write on your company letterhead to Koppers Company, Inc., Plastics Division, Dept. PE-109, Pittsburgh 19, Pennsylvania.

Offices in Principal Cities · In Canada: Dominion Anilines and Chemicals Ltd., Toronto, Ontario

HIGH DENSITY

KOPPERS PLASTICS

DYLITE® expandable polystyrene, DYLENE® polystyrene and DYLAN® polyethylene are other fine plastics produced by Koppers Company, Inc.

KOPPERS

8 *steps to better engineering writing...*

1.. VANITY AND LAZINESS, BE SIMPLE
2.. BE POSITIVE, BE BRAVE
3.. BE PERSONAL, BE SPECIFIC
4.. BE CONCISE, DON'T OVERSTATE
5.. VOCABULARY, GRAMMAR, PUNCTUATION
6.. TABLES, FIGURES, CAPTIONS
7.. WHERE TO PUT WHAT
8.. SIT DOWN AND WRITE

RICHARD M. KOFF, *senior associate editor*

Lesson . . 5

Up to now, we've been studying rules about **what** to write rather than **how.** Vocabulary, grammar, punctuation – these are the mechanics, the tools. And, frankly, you don't have the time or interest to go back and study them in detail.

But you've been speaking, thinking and reading the English language for decades. You can rely on your ear for words and phrases, and with the few hints given below, get away without a review of formal "book learning" in most of your writing.

This means you must rely on what sounds right to YOU—not what you think will sound right to your boss, customer or colleague. Don't try to write "down" to a serviceman in a manual, or "up" to an executive. Anything that sounds unnatural to you—any unfamiliar word, phrase or sentence structure will sound ten times stranger to the man who really knows how to use it.

Most good style manuals or writing texts cover these subjects far better than we can here. The serious student is referred to the bibliography at the end of Lesson 8.

VOCABULARY

Get a good desk dictionary and keep it within reach. If you don't know how to spell a word, look it up. And read the definitions while you're at it—you may be surprised.

To build a bigger vocabulary, read, but a $25 word should not be used if a 10¢ one can be found.

Watch out for: allusion-illusion, being that, between-among, case-instance, comprise, data, different than-from, due to, effect-affect, can't hardly, imply-infer, irregardless, lay and lie, like-as, literally, phase, principle-principal, regard, shall-will, that-which, type, unique, utilize, virtually, very, while, who-whom, you and I.

Here are five examples from the above list. Which are correct usage?

1 . . The higher temperatures will not effect steel hardness.
2 . . Are you inferring that our lathe screws are inaccurate?
3 . . It went together easily like a slip fit should.
4 . . This machine has a fairly unique joy-stick control.
5 . . The tests were virtually finished when we found the trouble.*

GRAMMAR

Again the best bet is to rely on your ear. What sounds right is most likely to be right. Your written English, with proper allowance for more careful phrasing, should be modeled from your spoken style. The most common offenders are:

The split infinitive. An infinitive, for these purposes, is a verb preceded by *to* (to go, to run, to design). The rule is: don't put an adverb modifier after the *to* and before the verb (to quickly go, to breathlessly run, to elegantly design). In each instance the modifier should precede or follow the infinitive. There are exceptions to this rule, but they're rare.

The dangling participle. A present participle (the usual offender) is a verb with an -ing ending. When a participial phrase starts a sentence, you must be very careful that the subject of the phrase is also the subject of the rest of the sentence.

Testing the bearing, race wear appeared at 1000 rpm.

Testing the bearing, I found race wear at 1000 rpm.

Being badly worn, I had the handle replated.

Finding the finish worn, I had the handle replated.

PUNCTUATION

In descending order of difficulty, commas, semicolons and colons cause most punctuation problems. Here's a rundown on these three, plus some comments on hyphens.

Commas. Parenthetical words and phrases should be separated by commas. (The oldest drill press, shaky and dangerous, was finally replaced.)

Independent clauses joined by a conjunction (and, but, for) should be separated by a comma. (I ordered the replacement parts, but I doubt that they will arrive on time.)

A series of items should be separated by commas. There is a difference in opinion about whether a comma should precede the "and." Decide for yourself and then be consistent. (Lines number one, two, and three will be shut down for repairs.)

For the rest, read a sentence aloud. Place a comma where you pause for emphasis or to make the meaning clear (assuming colons or semicolons do not apply).

Semicolons should separate independent clauses having no conjunction. In other words, two short, complete sentences which you feel belong together may be joined by a semicolon. (Take a short break; that gearbox is heavy.) The semicolon also separates major portions of a series separated internally by commas. (A short, small drill; a heavy, long bushing; . . .)

Colons usually introduce a list, a restatement or an example. (Standard screw threads will be: #4, 6, 8, and 10.)

Hyphens. Look up all compound words unless you are absolutely sure. Most compound modifiers of nouns and verbs take hyphens unless the first modifier ends in -ly. (A four-inch pipe, a fluid-power control, caught red-handed, *but:* an elegantly solved problem).

If you've got the time, dip into H. W. Fowler's *Modern English Usage* now and then. It's not always modern American, but it's a delight to read and includes more examples of good and bad prose than you'll find anywhere else.

***Reprints** of this series will be available at the end of October. To reserve your copy, Circle P15 on the Readers Service Card.*

**All are wrong.*

NEW...
from Skinner!

3-way, high-flow, solenoid valves for general industrial use

Main orifice sizes: full effective—⅜", ½", ¾" for ⅜", ½", ¾" NPT.

Standard operating pressures: 5 to 150 psi.

Media: oil, air, water, vegetable and petroleum oils, inert gases, kerosene, gasoline.

Types: normally open, normally closed and directional control in standard and explosion-proof construction.

These new, 3-way L3 Series valves, like all Skinner valves, are built to UL standards. Their bodies are made of forged naval brass and their internal parts are stainless steel and brass. Soft, synthetic inserts and seals provide bubbletight sealing. And a unique, Buna-N coated nylon diaphragm assembly assures long life. The valves are compact, light, and mount in any position, directly to the line. They are offered in a wide range of voltages and frequencies, with many electrical options and manual override.

Typical applications: air vises, chemical process equipment, presses, water treatment equipment, industrial machinery, packaging machinery, air and hydraulic cylinders, laundry machinery, etc.

Skinner solenoid valves are distributed nationally.

For complete information, contact a Skinner Representative listed in the Yellow Pages or write us at Dept. 450.

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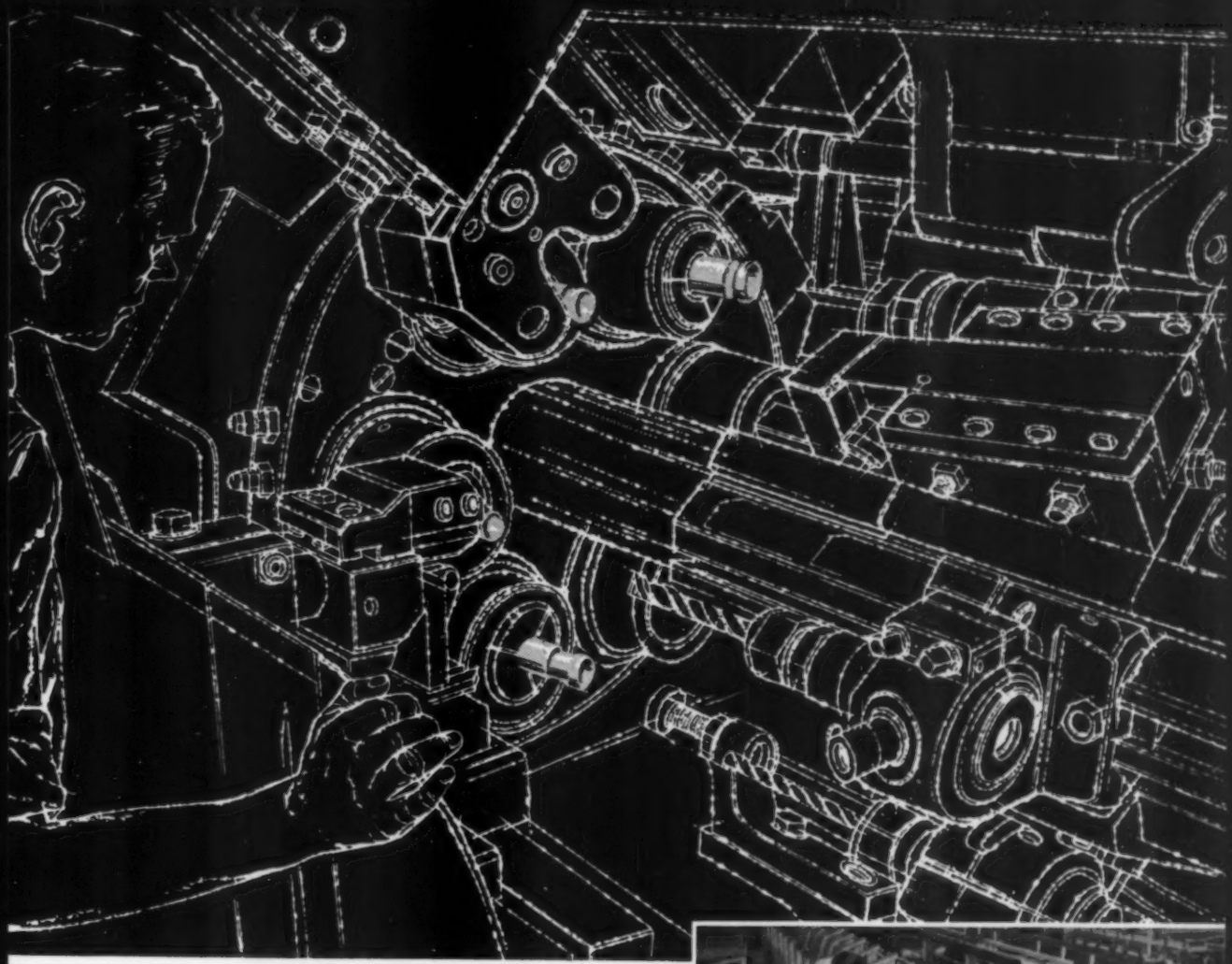

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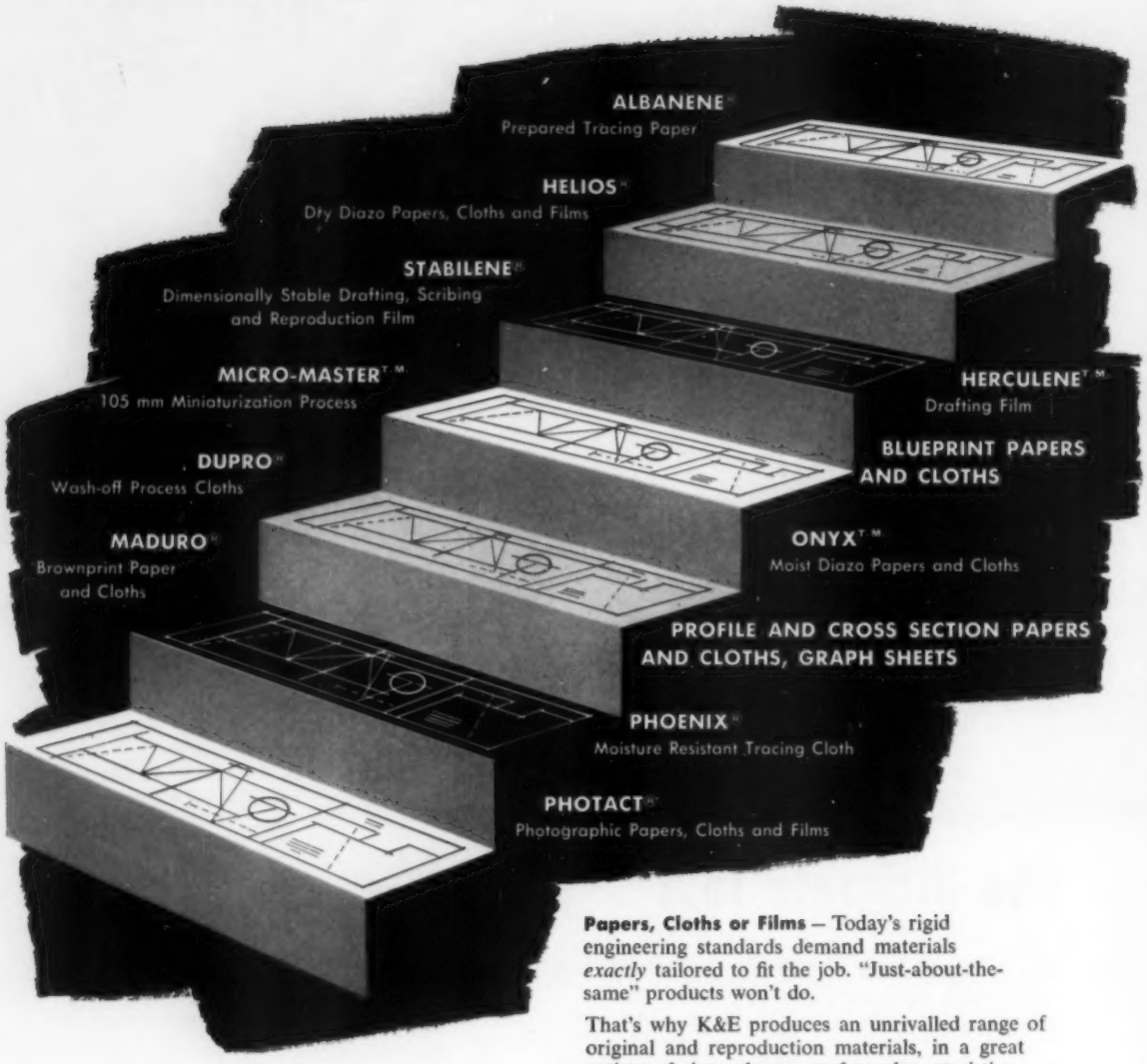

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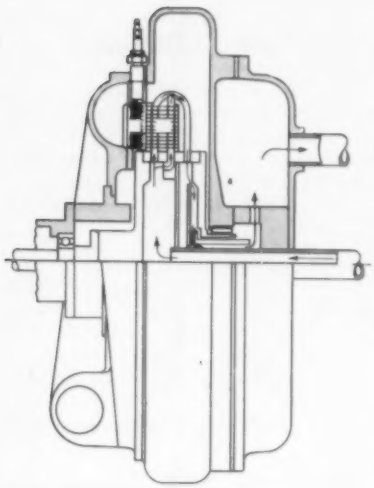
SIGNIFICANT COMPONENTS MATERIALS PROCESSES



Centrifugal-action liquid heater . . .

can also be used to cool, vaporize or condense. Model for steam generation can produce steam of up to 125 psi in 20 sec. Rated at about 10 hp, may be gas or oil-fueled. High relative velocity between gases and rotating surface results in high-heat transfer and self-induced flue outlet pressures. In liquid heater model, liquid within tubes is under substantial pressure while being heated, raising boiling point, preventing boiling at tube walls and reducing formation of scale. This model also generates steam (to 30 psi) when reversed. May be mounted and operated in any position. Power of 300,000 BTU per hr in 24 x 20 x 26 in. space is said to be possible. Available in single, duplex or multiple arrangements in series or parallel to achieve high capacities. Liquid heater lists for $950; steam generator is $1450. About 4-wk delivery. **Turb-O-Heat Inc, 1133 E 35th St, Brooklyn 10, NY.**

Circle 101 on Reader Service Card

Static voltage control . . .

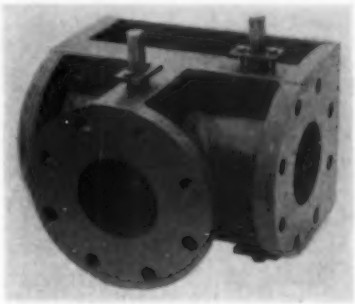
for 1 to 200 hp motors operating on 50 or 60 cps provides constant torque over 8:1 speed range, but constant-hp speed range is also obtained with motor-field control. Efficiency of over-all system is said to be in range of 70 to 83% above half-speed. Supply of three-phase, 208 to 220 or 440 v power can be used. Since opening and closing of power circuit is performed ahead of rectifier, dc contactor has been eliminated and advantages of ac interruption are made available to user. Furnished in floor-mounted cabinet, force-ventilated in higher hp. 1 to 40 hp units are priced 10% higher than Type AV drive, which includes mg set for power conversion; above 40 hp, price is the same as AV drive. Delivery of standard drives, 10 wk; special drives, 20 to 25 wk. **Westinghouse Electric Corp, PO Box 2099, Pittsburgh.**

Circle 102 on Reader Service Card

Self-curing zinc coating . . .

only a few mils thick is reported to protect steel surfaces exposed to water, severe weathering, salt spray and abrasion. Film thickness is not critical. Said to have excellent adhesion, physically and chemically, to steel. May be used wherever galvanizing is suitable and may be applied to steel structures or members of any size, before or after erection, with regular painting equipment. Reported to be resistant to organic solvents, to be nontoxic and to contain no volatile or flammable materials. Savings of up to 50% in application time are predicted because it eliminates application of a separate curing solution. From stock. **Amercoat Corp, 4809 Firestone Blvd, South Gate, Calif.**

Circle 103 on Reader Service Card



2-in-1 valve . . .

is no-thrust vibration-proof butterfly valve in flanged T body. Shaft packing may be removed from either end of through shaft for inspection, replacement or adjustment without removing valve. Constructed of corrosion-resistant materials and has either metal-seated or neoprene-seated valves. Bodies are manufactured to dimensions of ASA Class 125 cast iron flanged fittings, ASA B 16a. Available in sizes 1 through 12 in. Said to cost up to 33% less than two butterfly valves and conventional T installation. 2-3 wk delivery. **US Valve & Engineering Co, PO Box 14015, Houston.**

Circle 104 on Reader Service Card

Panel-mount interval timer . . .

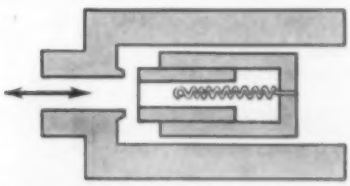
starts from a momentary pulse and automatically resets at end of preset cycle. Reset time is less than 0.02 sec over complete time scale, regardless of time cycle. 12 models are available with over-all time cycle of from 1 sec, with min setting of 1/60 sec, to 3 hr, with min setting of 3 min. Repeat accuracy is ±3 to 5 millisec over complete 1 sec scale. Standard models are 115 or 220 v, 50 or 60 cps. Load rating is 15 amp, rated at 115 v, 60 cps noninductive. Priced at $43 and $45.50 each. Stock to 5-wk delivery. **Industrial Timer Corp, 1407 McCarter Highway, Newark 4, NJ.**

Circle 105 on Reader Service Card

High-current timer . . .

for electronic timing applications where multiple pulsing can be used to trigger several programmed functions. Miniature, transistor-equipped, potted timers are basically free-running pulse generators with externally adjustable period and pulse. Operates on 18 to 32 v dc at 60 milliamp max. Capable of handling 25 amp, 32 v inductive over ambient temperature range of −67 to 257 F. Timers have square wave output from transistors with max transfer of 7 millisec. Period is variable from 0.1 to 1 sec; pulse width, from 25 to 100 millisec. Units withstand vibration of 5 to 2,000 cps (10 g) and shock of 50 g for 11 millisec. Weighs 75 gm. $450 each (for 10). 2-wk delivery. **Timech Corp, 13866 Saticoy St, Van Nuys, Calif.**

Circle 106 on Reader Service Card



Inertia shut-off valve . . .

originally developed for liquid fuel system, prevents build-up of fluid pressures. Supplied in any line size. 1-in. line size unit, weighing 0.85 lb has flow rate of 9 gpm with pressure drop of 0.5 psi max. Operates in −65 to 257 F. Closes when forward acceleration is 2 g and over; opens when acceleration falls to 0.5 g min. **Aero Supply Mfg Co Inc, Corry, Penna.**

Circle 107 on Reader Service Card

Vibration can't loosen Loctite-treated fasteners

The HOMELITE six-horsepower chain saw weighs only 19 pounds. So much power per pound requires maximum resistance to vibration in the fasteners holding parts together.

LOCTITE, the liquid lock washer, locks all critical fasteners on this gasoline-driven chain saw . . . providing dependable service in rugged field use.

LOCTITE Sealant is a liquid which hardens between metal parts to form a bond with greater holding power than any mechanical locking device. The added holding power of LOCTITE-treated fasteners allows Homelite to use reduced tightening torques and thus avoid stripping threads in the aluminum castings.

While adding to product reliability, LOCTITE provides substantial cost savings. At Homelite, the 27 different size fasteners required in assembling the chain saws are treated with LOCTITE by tumbling in plastic bags. Treated screws store for days . . . lock only when assembled.

There's a Loctite application method suited to all production requirements. If your product faces shock and vibration in use, you can eliminate breakdowns due to loose threaded fasteners . . . cut service cost and customer complaints . . . by using Loctite. Write for literature and free sample.

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AMERICAN SEALANTS COMPANY
119 Woodbine St., Hartford 6, Conn.
Sold by selected bearing and industrial distributors.

SIGNIFICANT COMPONENTS
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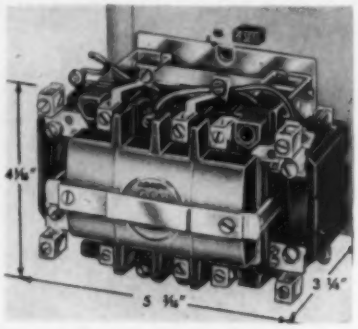
PROCESSES . . .



Magnetic starter controls . . .

for constant speed motors in NEMA sizes 0 and 1, for single and polyphase operation, are rated up to 7½ hp at 200 v and 10 hp at 440 and 550 v. Standard 60 cps coils available are 110-120 v, 208-230 v, 440-480 v, 550-600 v. Arrow-Hart & Hegeman Electric Co, 103 Hawthorn St, Hartford 6, Conn.

Circle 108 on Reader Service Card

Control valves . . .

have one operator, which can be inverted to utilize 3 to 15 psi air signal to open or close valve. Standard body pressure rating is 300 psi. Body temperature rating is 450 F with standard bonnet. Flow coefficient ranges from 0.002 to 13.2. George W Dahl Co Inc, 86 Tupelo St, Bristol, RI.

Circle 109 on Reader Service Card

Flush pushbuttons . . .

are oil-tight. 1¼ in. from front of panel to the back of one contact block with a ⅜ in. projection in front of the panel. Stacking of blocks behind operator permits control of several operations simultaneously. Westinghouse Electric Corp, PO Box 2099, Pittsburgh 30.

Circle 110 on Reader Service Card

Stainless stem thermometer . . .

is waterproof and can be reset and recalibrated by user if necessary. Range, 0 to 220 F. Stem is 6 in. long x ¼ in. dia. $8.75 each, FOB Los Angeles. Pacific Transducer Corp, 11836 W Pico Blvd, Los Angeles 64.

Circle 111 on Reader Service Card

High carbon steel bearings . . .

are said to offer large price reductions compared to similar-sized precision ball bearings. Global Ball & Bearing Co Inc, 1847 Highland Ave, New Hyde Park, NY.

Circle 112 on Reader Service Card

Teflon-to-Teflon bonding . . .

reacts with Teflon to form carbonaceous film, which serves to anchor adhesives. Rates of 50 to 60 fpm are said to be possible on continuous-dip lines. Priced at $4 for each 2-oz bottle (treats 1 to 3 sq ft) in lots of less than 25. W L Gore & Assoc Inc, 487 Papermill Rd, Newark, Del.

Circle 113 on Reader Service Card

Self-aligning pillowblock . . .

with oil-impregnated bronze bearing nested in aluminum die-casting for applications where self-lubricating bearing in flexible mount is required. Available in shaft sizes ½, ⅝ and ¾ in. Bronze Bearings Inc, 3832 N Cicero Ave, Chicago.

Circle 114 on Reader Service Card

High-temperature motor . . .

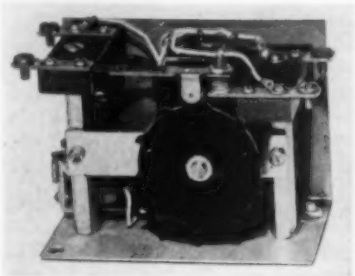
is said to operate at temperatures of 425 F with 53 F coil temperature rise. 115 v ac, 400 cps. Reversible, intermittent-duty unit has speed of 10,000 to 11,000 rpm. Calco Mfg Co, 205 Factory Rd, Addison, Ill.

Circle 115 on Reader Service Card

Warehouse stock shapes . . .

of Delrin and nylon 6 plastics include rods and tubes to 15 in. OD and 12 in. ID; plates to 2 in. thick and 12 in. wide; strip and sheet stock to 12 in. wide and lengths of rod, tube and plate to 10 ft. Cadillac Plastic & Chemical Co, Detroit.

Circle 116 on Reader Service Card



Cycle timer . . .

interrupts electric circuits on prearranged time settings. Any sequence of on-off combinations within basic cycle of 150 sec. Contact rating is 15 amp at 115 v ac. Signatrol Inc, 2nd and Spelter Sts, Danville, Ill.

Circle 117 on Reader Service Card

Reactive-metal tubing . . .

including columbium, tantalum and vanadium, is furnished in seamless grade and in fully annealed, half hard drawn and full hard, as well as in intermediate tempers, in sizes from 0.012 to 1.125 in. OD. Superior Tube Co, 1779 Germantown Ave., Norristown, Penna.

Circle 118 on Reader Service Card

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- Increased productivity
- No stretch
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- No backlash
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- Compact
- Wide speed range
- Wide horsepower range
- Synchronization
- High mechanical efficiency
- Easy installation

Want more facts? Write for your copy of a 64-page Positive Drive Manual. Address Worthington Corporation, Section 79-24, Oil City, Pa. Ask for Bulletin 7950-B3. In Canada: Worthington (Canada) Ltd., Brantford, Ont.

*T.M. The Goodyear Tire & Rubber Co.

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Designed by International Business Machines Corporation.

Custom molded by Molded Fiber Glass, in one piece, in matched metal dies.

Exceptionally strong, resistant to rust and corrosion, resistant to mechanical damage.

Extremely lightweight, easy to remove and replace for servicing of clock mechanism.

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Molded Fiber Glass Company

4423 Benefit Avenue, Ashtabula, Ohio

SIGNIFICANT COMPONENTS MATERIALS PROCESSES . . .

Redesigned valve actuator . . . provides zero and stroke adjustments. While retaining original thermal-release principle (see PE—Nov 3 '58, pp 33), which position final control elements, device has more efficient vapor-producing liquid. Develops 300 lb of thrust and has adjustable stroke span of 0.5 to 1.5 in. Response speed is 0.1 in. per sec. Swartout Co Inc, 18511 Euclid Ave, Cleveland.

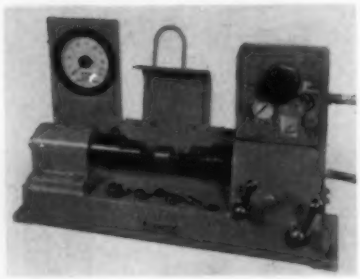
Circle 119 on Reader Service Card

Reproductions to 6 x 20 ft. . . . are said to be accurate to 0.003 in. within 14 ft. Can be made on any dimensionally stable material. Capitol Reproduction Inc, 835 Holden Ave, Detroit 2.

Circle 120 on Reader Service Card

Digital stop clocks . . . for ac may be used for 60 and 400 cps operation; dc units, for 20 to 30 v operation. Said to be accurate over wide voltage and ambient temperature variations. Has electrical reset. A W Haydon Co, Waterbury 20, Conn.

Circle 121 on Reader Service Card



Pneumatic speed tester . . . for variable speeds from 1000 to 75,000 rpm, which can be read from dial tachometer or reed vibration tachometer. Powered by two air motors, bench type, which measures 10 x 13 x 24 in. long. Checks for average or max durability and alignment under operating or greater than operating conditions. Also for destructive testing and optimum rating or qualitative checking of assemblies or parts required to operate at given standards under calculated conditions. Can be used with commutators, electrical or mechanical specimens or assemblies that require low or high speed centrifugal qualities. With dial tachometer, $2,590; with reed vibration tachometer, $2,390. 6-wk delivery. Vulcan Tool Co, 730 Lorain Ave, Dayton 10, Ohio.

Circle 122 on Reader Service Card

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Send a complete resume of experience and education, along with your salary requirements, to S. Benton Davis; Reynolds Aluminum Supply Company; P. O. Box 1367; Atlanta, Georgia. Early application will receive immediate consideration.

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Ball or Spherical Roller
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TYPE SDAF
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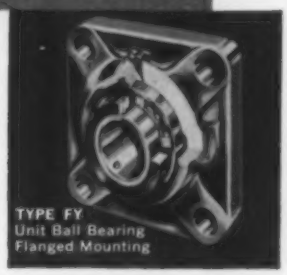
TYPE SY
Unit Ball Bearing
Pillow Block

TYPE SES
Unit Rubber Box Ball
Bearing Pillow Block



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NEW LITERATURE

Inventor's Progress

JOACHIM G LEITHAUSER. World Publishing Co, 2231 W. 110th St, Cleveland 2, Ohio. 6½ x 9½, 286 pp. $4.50.

Translated from the German, this book tells in anecdote form the story of today's revolution in technology and how it came to be. This is not a chronological history, but a study of the highlights, arranged by fields of technology; power, transportation, communication. The first chapters discuss power, both heat and electric, and how they were applied to trains, ocean liners, automobiles, airplanes. The final chapters chronicle significant events in the fields of electronics, lighting, printing and computing machines.

The early history of a science is of most interest to the author; he skips quickly over the intervening years of development and innovation to show the huge industries that have grown from this modest beginning. Although the book suffers, as do most histories of this kind, from the problems of trying to cover too much ground, too many developments, in a too short space, it brings in many new details and many little-known experimenters that helped to foster this remarkable period of our history. —CJL

Masters of Modern Architecture

JOHN PETER. George Braziller, Inc, 215 4th Ave, New York 3. 230 pp, 9½ x 12¾. $15.

On the dust jacket of this book may be found a quote from one of John Ruskin's essays on architecture, "Architecture is an art for all men to learn, because all are concerned with it." Certainly this may be said to apply to engineers, because men such as Wright, Corbusier, van der Rohe and Saarinen have exerted some of the strongest influences on the shape—and even some of the functions—of today's manufactured products. And as John Peter points out in his introduction, the design of some of the buildings considered the forerunners of present-day architecture were initially the work of engineers.

To review this book adequately would require pages of space for some of the magnificent photographs of great architectural achievements that are the book's principal reason for being. In addition, statements by the world's principal contemporary architects giving their concepts of their field and their work are included, together with descriptions of the 95 buildings illustrated. It is likely that no reader will approve all of the author's choices of buildings and certainly some of the opinions expressed by the architects quoted are highly controversial, but the book proves architecture's right to be called the greatest art of our day. —JK

CORROSION – RARE AND REACTIVE METALS – Wall chart. Provides comparative corrosion resistance of zirconium, titanium, tantalum, Hastelloy C and stainless 316 tubing to 43 commonly encountered reagents. Damascus Tube Co, Greenville, Penna.

Circle 140 on Reader Service Card

MATERIALS EVALUATION–Bulletin 5902, 6 pp. Describes facilities and services for analysis, development, research and inspection of materials and products. United States Testing Co, 1415 Park Ave, Hoboken, NJ.

Circle 141 on Reader Service Card

DESIGN OF DIGITAL SYSTEMS – Booklet, 36 pp. Presents fundamentals of symbolic logic as applied to design of digital systems. Computer Control Co Inc, 983 Concord St, Framingham, Mass.

Circle 142 on Reader Service Card

WRITING A TECHNICAL BOOK–Manual, 50 pp. Tells how to prepare manuscripts of business, industrial, engineering and professional books and how to arrange for their publication. F W Dodge Corp, 119 W 40th St, New York 18.

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COMPUTER APPLICATIONS – Brochure, 5 pp. More than 200 data processing applications of IBM 704-650 computer in the engineering field are listed. Service Bureau Corp, 425 Park Ave, New York 22.

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SERVO COMPONENTS–Brochure, 16 pp. Describes equipment, facilities and products of company. Contains specs on control and torque synchros and resolvers. Vernitron Corp, 136 Church St, New York 7.

Circle 145 on Reader Service Card

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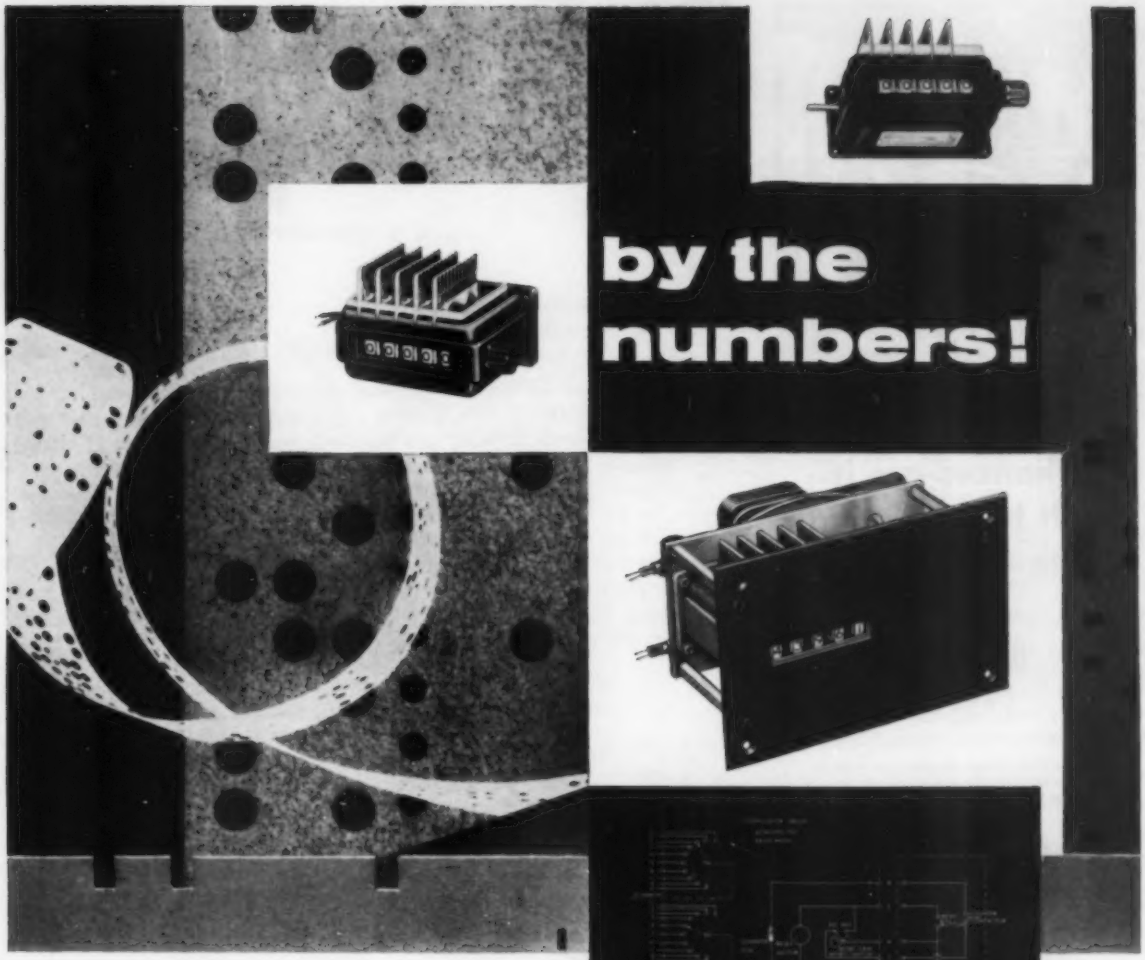

by the numbers!

How these counters work: Data Readout Counters are actuated mechanically by rotation of a shaft or electrically by making and breaking a circuit. Each wheel has a printed circuit with a contact for each digit. Remote Data Readout Counters are available with manual or electrical reset, and for base or panel mounting. Standard Models are available from stock.

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Now . . . Veeder-Root Remote Data Readout Counters can provide a low-cost method of collecting and feeding important information . . . by transmitting counter readings electrically.

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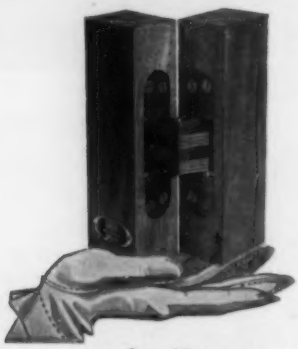

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For Your Information (personal)

Introducing bioelectronics

Close on the heels of personal magnetism comes personal signaling. This time, though, it's sparking a new science with a fancy new name: *bioelectronics*. It deals, says the Navy, with "measurement of electrical changes associated with body functions;" and it's considered a part of Human Engineering. Typical of the subjects encountered are these:

- The human transmission system.
- Amplitude and frequency of bioelectric signals.
- Bioelectric components: electrodes and transducers.

These particular topics are chapters in the first definitive literature survey on bioelectronics, just published by Office of Technical Services. It's PB 151291, available from OTS, Washington 25, DC for $2.75.

Butter your stator

To protect stator windings against moisture, dirt, abrasives, and chemicals, Houghton Laboratories Inc, Olean, NY, is offering a new thixotropic gel which, it says, can be applied even to hot motors with a "simple butter technique." It's a two-component epoxy system, mixed just before use, and cured by oven-baking.

Like other thixotropic materials, which flow readily when worked, yet stay put when applied (see photo), this one won't drip off even from vertical surfaces. (The word "thixotropic," incidentally, is derived from the Greek *thixis*, a *touch*; and *tropy*, meaning *turning* or *curved in a specified way*—literally, a material which "turns at a touch.")

Broken bone? Loose tooth? Glue 'em

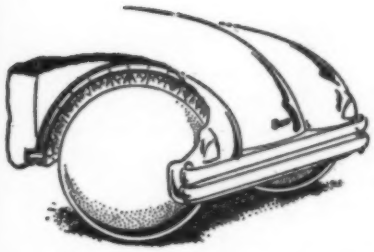
Fixing a broken bone or replacing a loose tooth may be easy as joining two structural sections if Army and Navy research on adhesives pays off.

Army Medical Service is testing foamed urethane adhesives for the repair of fractured bones, under the theory that the porous foam will permit the bone cells to grow right through the joint and eventually replace the plastic, which will gradually be absorbed or washed away. Tests so far look extremely encouraging, though Army researchers want to know more about long-term effects of the plastic on the body.

Meanwhile, the Navy, not to be outdone, is trying new resin adhesives as a means for replacing and repairing teeth. The idea: when a tooth comes out, it can simply be glued back in place, eliminating the need for dental plates and other appliances. —ARG

Why Don't They

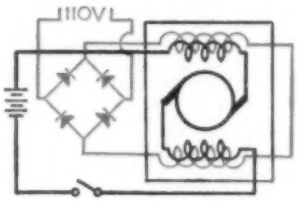
RESEARCH and DEVELOP . . .



. . . a unique vehicle that moves on three spherical rubber wheels. Supported this way, it should be able to roll easily over low obstructions and turn sharply, moving sideways if desired. If the chassis were separated from the "wheels" by a jet of low-pressure air, the result would be much like the wheelless, "ground-effect" vehicles (now under development by several automotive and aircraft companies) except that the rubber spheres would be interposed between chassis and ground. Thus it would have many of the advantages of the ground-effect vehicle and the additional advantage of continuous ground contact, which simplifies propulsion and control. Also, the low-pressure air support would be more efficient because it works against the smooth surface of the sphere, not the rough, unpredictable surface of the ground. For propulsion, rubber spheres could be driven magnetically with a squirrelcage rotor inside and an alternating field in the hemispherical air pad. Or jets could be directed against the sphere to turn it turbine-fashion. —G D PHEIL

. . . an electrically heated windshield wiper blade. This would help clear away ice that builds up when car is parked in freezing rain, and eliminate the problem of blades being fouled and distorted by accumulated slush and snow while driving. A resistance coil molded into the rubber blade, electric blanket-fashion, would probably do the trick. —G. S. PAIL

. . . a starting motor for automobiles that has a 110-v AC winding in addition to the 6- or 12-volt one. Most cars are garaged where an electric outlet is readily accessible. Conventional house current could supply the necessary power no matter how cold the morning or how low the battery. —G KARTMAN



. . . an inexpensive, portable clothes dryer for apartment house dwellers. A small infrared unit, selling for less than $20, would turn any kitchen sink into a small laundry when the weekly "emergency" arises and a few important items must be washed and dried on short notice. —M MALONEY

Have you a problem, based on known scientific principles, which seems to have an answer somewhere within the limits of present technology? To inspire inventors along worthwhile paths, PRODUCT ENGINEERING invites you to trade such problems with fellow readers who may have a fresh viewpoint or more time for necessary R & D. We will pay $10 for each one accepted.

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Publisher's Postscript...

the IDEAL AD

In the August 24 issue I asked for your definitions of the ideal advertisement. So many cards were received that there's no possibility of printing them all. But there is little question about what you want.

First, and foremost, you want FACTS.

"I do not read for pleasure but for ideas or planned products I can use."–Paul F. Ferreira, Jr.

"Ads should contain factual information."–John J. Snowdon, engineer, General Electric Co.

"An enlarged section that describes functions, applications, and limitations, with a segregated boxed-in area for detailed data."–Robert R. Fleming, project leader, Designers for Industry.

"Gives all the facts. . ." R. W. Nordin, department chief, Teletype Corp.

"Have advertisers send facts and figures, not pictures and copies of the ad you started with!"–George Bigham, design engineer, Aerojet General Corp.

"The ideal ad should state clearly what the product is, its basic principles, uses, and where to obtain further detailed information."–Everett L. Potts, Jr, technical services engineer, Champion Paper & Fiber Co.

And the facts might also include PRICE.

"Put the price of what is being advertised in your ads –we need to know."–Frank A. Ruhmann, chief engineer, Fostoria Corp.

"Tell what you have that the reader needs, now, at a price that is competitive."–James P. Davis, vice president, GES Engineering.

And the ideal ad should have more READER in it, and less writer.

"It should clearly and quickly suggest ways of improving my product."–L. R. Greif, president, Greif Associates, Inc.

"It should tell the designer what he needs to know to use the product in *his* design." R. E. Bruckner, senior advisory engineer, Westinghouse Electric Co.

But I think my favorite takes you one step further.

It calls for a creative contribution from the copywriter and the manufacturer's own engineering team.

"The ideal advertisement should define a product explicitly, imply its potential, and stimulate the mind to new unexplored applications."—Edwin N. Dejewski, chief engineer, Q-Tips, Inc.

Advertising managers please note. —SJA

Issue of October 5, 1959
Product Engineering
Card Expires December 4, 1959

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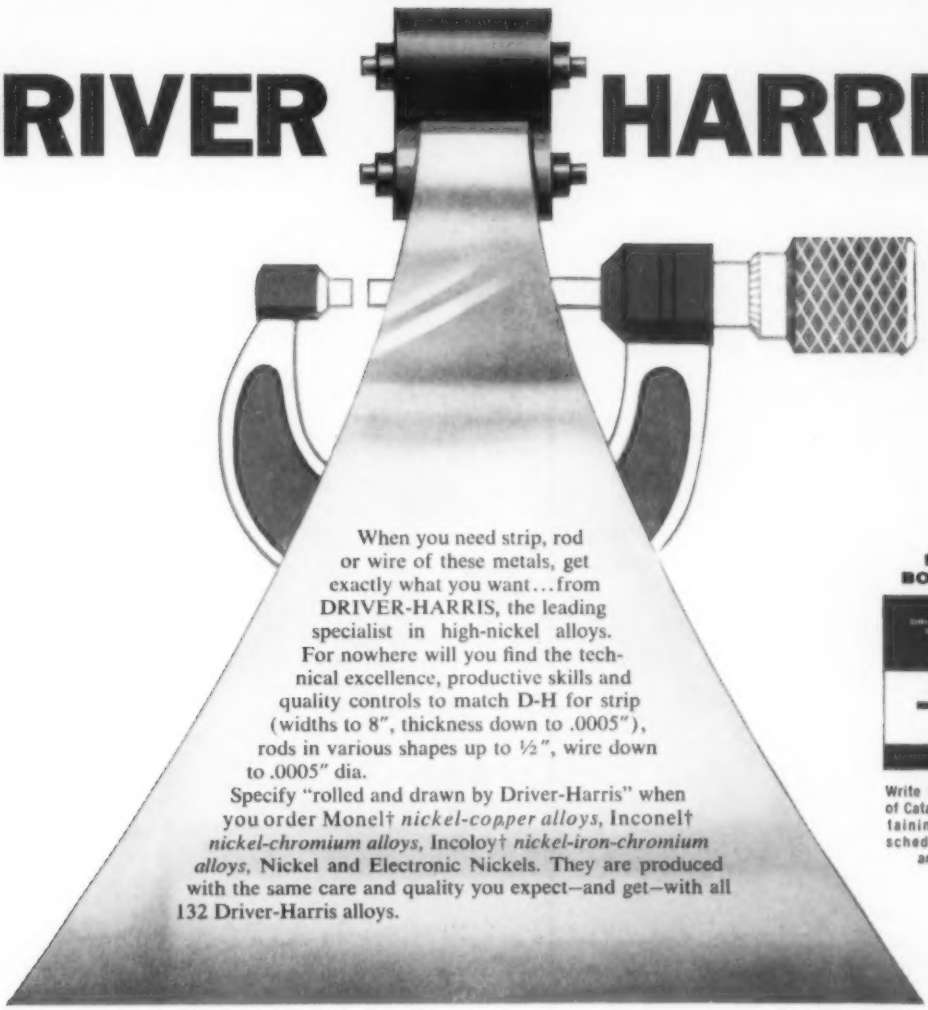

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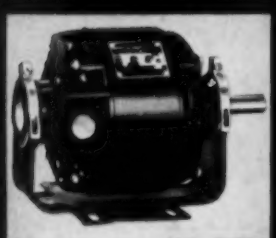

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